VOLUME TWO

TECHNICAL APPENDICES

FINAL ENVIRONMENTAL IMPACT STATEMENT

ORANGE LINE RELOCATION AND ARTERIAL STREET CONSTRUCTION

(SOUTHWEST CORRIDOR PROJECT)

SOUTH COVE TO FOREST HILLS
BOSTON, MASSACHUSETTS

UMTA PROJECT NO. MA-23-9007
FHWA PROJECT NO. U-393 (1)

DEPARTMENT OF TRANSPORTATION • UNITED STATES OF AMERICA

U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION
FEDERAL HIGHWAY ADMINISTRATION

MARCH 1978

DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION

FINAL ENVIRONMENTAL IMPACT STATEMENT AND 4(f) STATEMENT

ORANGE LINE RELOCATION AND ARTERIAL STREET CONSTRUCTION SOUTH COVE TO FOREST HILLS, BOSTON, MASSACHUSETTS

UMTA PROJECT MA-23-9007
FHWA PROJECT U-393(1)

This transportation improvement is proposed for funding under the Interstate substitution provision and primary funds provision of the Federal-Aid Highway Program, Title 23, United States Code.

This statement is submitted pursuant to Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969; Sections 3(d)and 14 of the Urban Mass Transportation Act of 1964, Section 4(f) of the Department of Transportation Act of 1966; and Section 106 of the National Historic Preservation Act of 1966.

2/24/78
Date

By: John K. Taylor
John K. Taylor
Acting Associate Administrator
for Transit Assistance

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ii) CROSS REFERENCES FOR FIGURES IV-20 THROUGH IV-68 LISTED IN SECTION 4.0 OF VOLUME I:

For the sake of brevity in this Environmental Impact Statement, certain drawings which appeared in the Environmental Impact Analysis have been removed. The plan information (alignment and Parcel numbers) is similar to the drawings PHP-1 and 2, although not identical. Profile information for all alternatives has been consolidated on the PHP-1 and -2 drawings. Representative sections of several alternatives have been included in this statement. Because the scale of the sections makes minor differences in elevation indistinguishable, the Post-Hearing Profile is not illustrated by separate section drawings but balls in between those of the Full and Modified Depression. Plans and Sections are found in the first section of Volume II of II. A correlation of the Plan sheets listed is as follows:

ORIGINAL DRAWING NUMBERS								NEW DRAWING NUMBERS	
SC-1	SC-2	FH-1	FH-2	FH-3	FH-4	FH-5	FH-6	PHP-1	PHP-2
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--	--	IV-20	IV-27	IV-34	IV-41	IV-49	IV-56	IV-56	IV-49
--	--	IV-21	IV-28	IV-35	IV-42	IV-50	IV-57	IV-57	IV-50
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--	--	IV-24	IV-31 &31A	IV-38	IV-45 &45A	IV-53	IV-60	IV-60	IV-53
--	--	IV-25	IV-32	IV-39	IV-46	IV-54	--	IV-54	IV-54
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B. Carbon Monoxide Concentrations - 1975, 1980, and 2000

C. Transportation Analysis

D. Rail Service Replacement During Construction

E. Rapid Transit Traction Power Supply and Distribution

F. Engineering Details for Dropped Alternatives

G. Relevant Correspondence

H. Noise and Vibration Impact Analysis

I. Properties in the Southwest Corridor Owned by the Massachusetts Department of Public Works

J. Forest Hills Parking Facility

K. Relocation and Land Requirements

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LIST OF FIGURES IN APPENDICES (Continued)

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ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PROJECT LOCATION

RAIL TRANSIT ARTERIAL

LEGEND

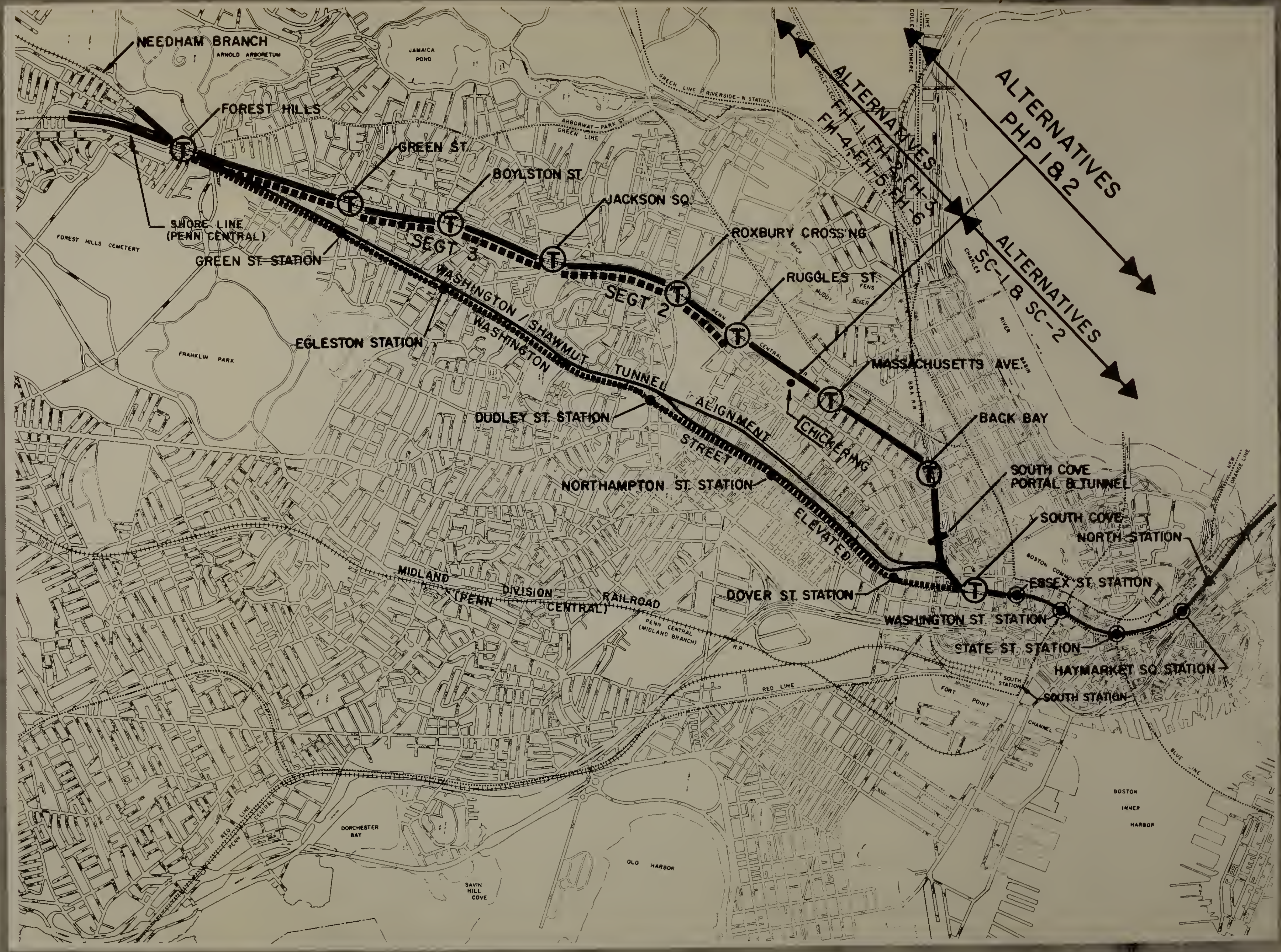
- RELOCATED ORANGE LINE & RECONSTRUCTED RAILROAD
- PROPOSED STATIONS
- EXISTING ORANGE LINE TUNNEL
- EXISTING WASH. ST. ELEVATED
- EXISTING STATION LOCATIONS
- STATION TO BE REMODELED
- ARTERIAL STREET
- WASH./SHAWMUT TUNNEL ALIGN.
- PHP POST HEARING PROFILE

NORTH

SCALE

0 1200 2400 3600

FIGURE IV 102



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

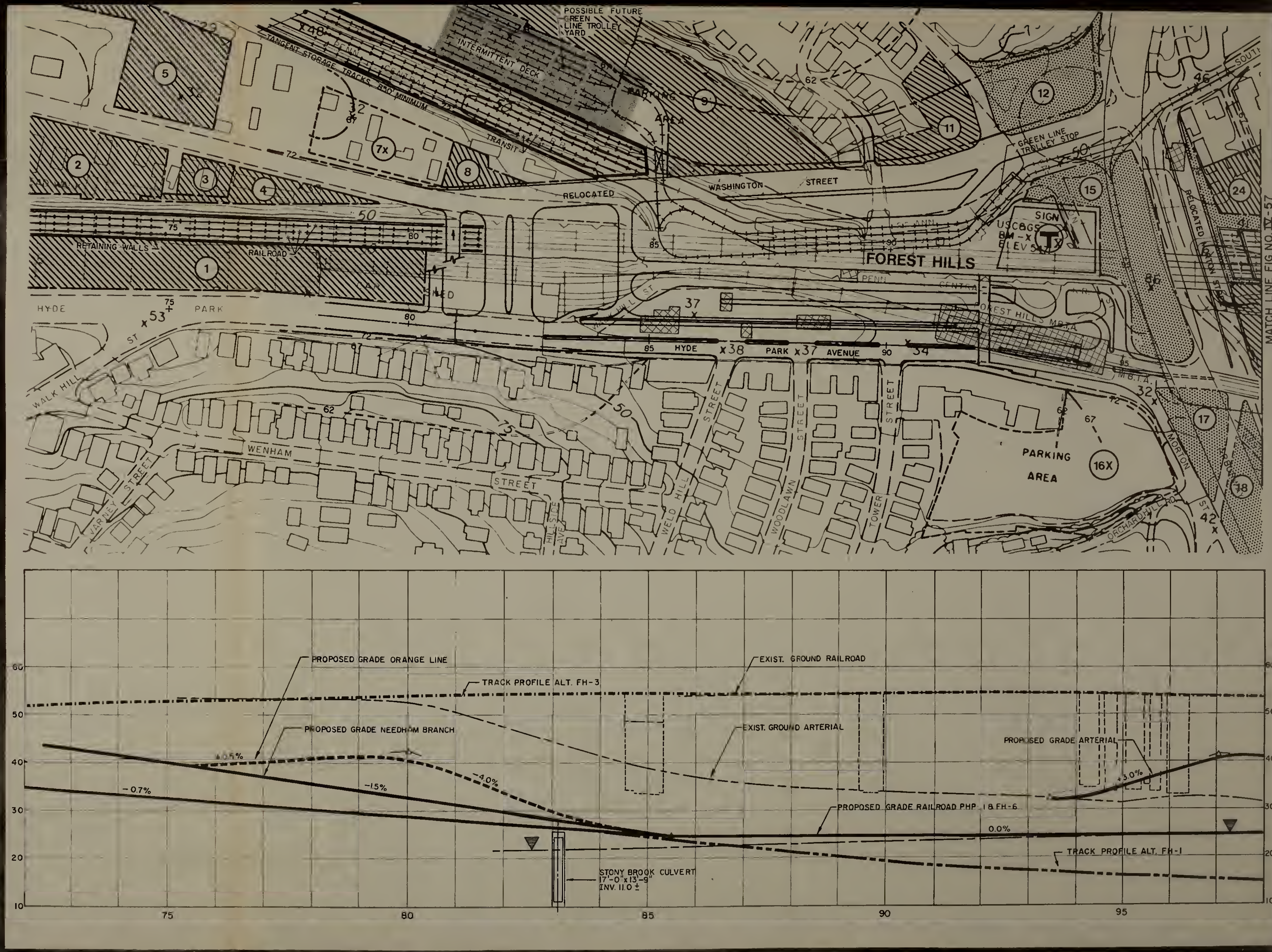
POST HEARING DEPRESSED RAIL / TRANSIT NO ARTERIAL STREET ALTERNATIVE

LEGEND

- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS
- 62 NOISE CONTOUR (62 Decibels)
- 67 " " (67 Decibels)
- 72 " " (72 Decibels)

SCALE
0 100 200 300

FIGURE IV-56



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

POST HEARING DEPRESSED RAIL / TRANSIT ARTERIAL STREET EAST ALTERNATIVE

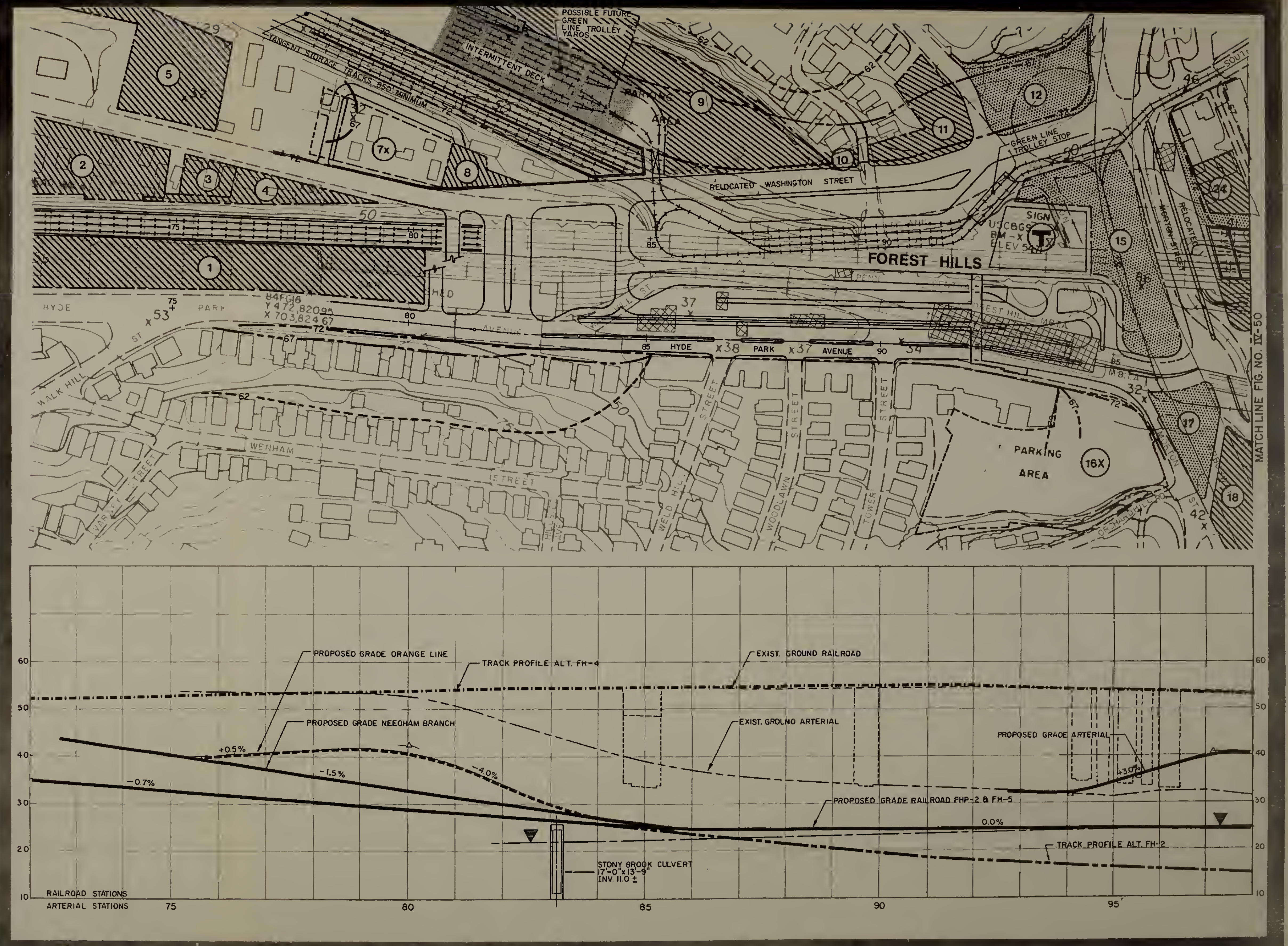
LEGEND

- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- 13 PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS
- 62 NOISE CONTOUR (62 Decibels)
- 67 " " (67 Decibels)
- 72 " " (72 Decibels)

SCALE
0 100 200 300

NORTH

FIGURE IV-49



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

POST HEARING DEPRESSED RAIL / TRANSIT NO ARTERIAL STREET ALTERNATIVE

LEGEND

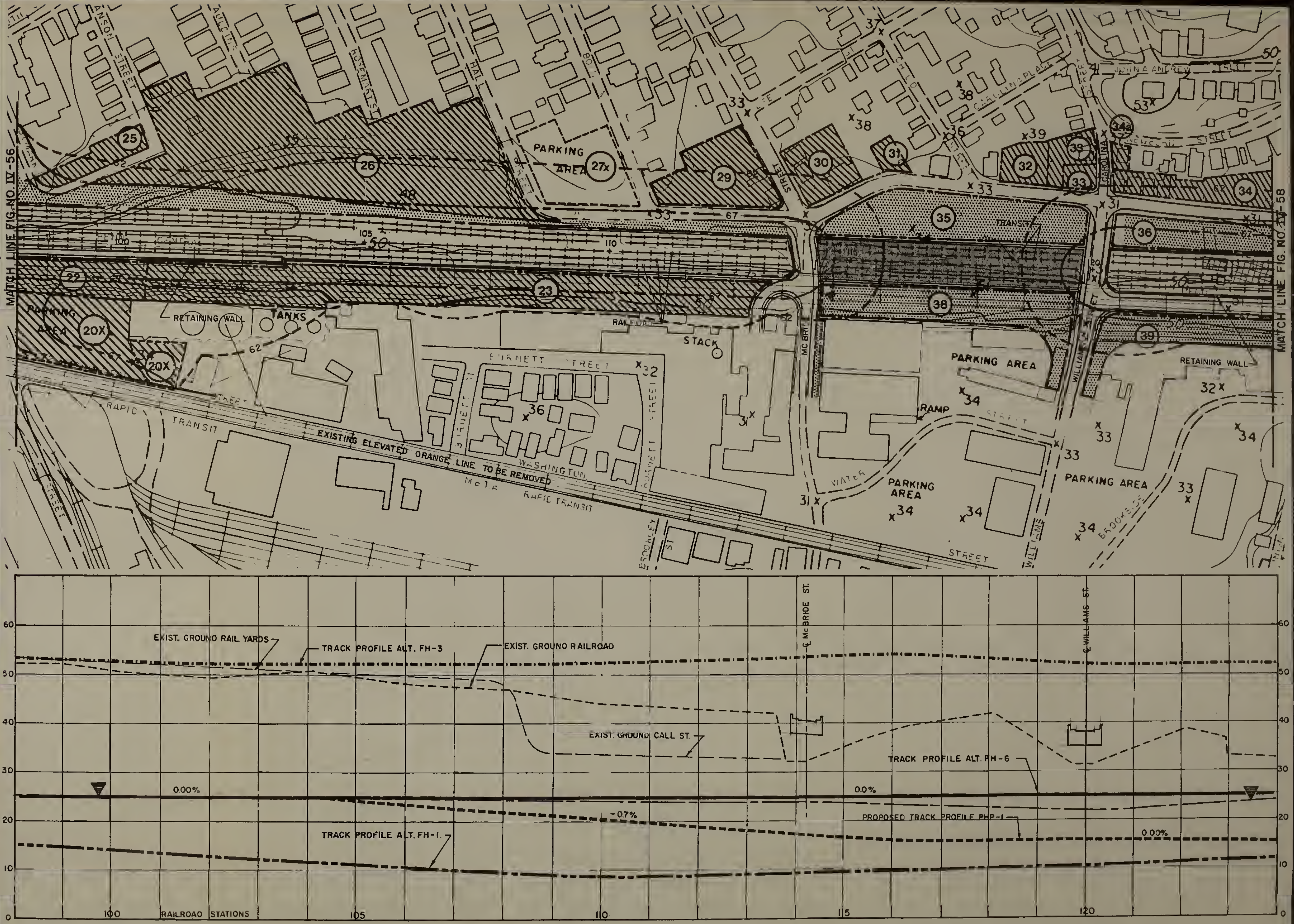
- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS
- 62 NOISE CONTOUR (62 Decibels)
- 67 " " (67 Decibels)
- 72 " " (72 Decibels)

SCALE

0 100 200 300

FIGURE

IV–57



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

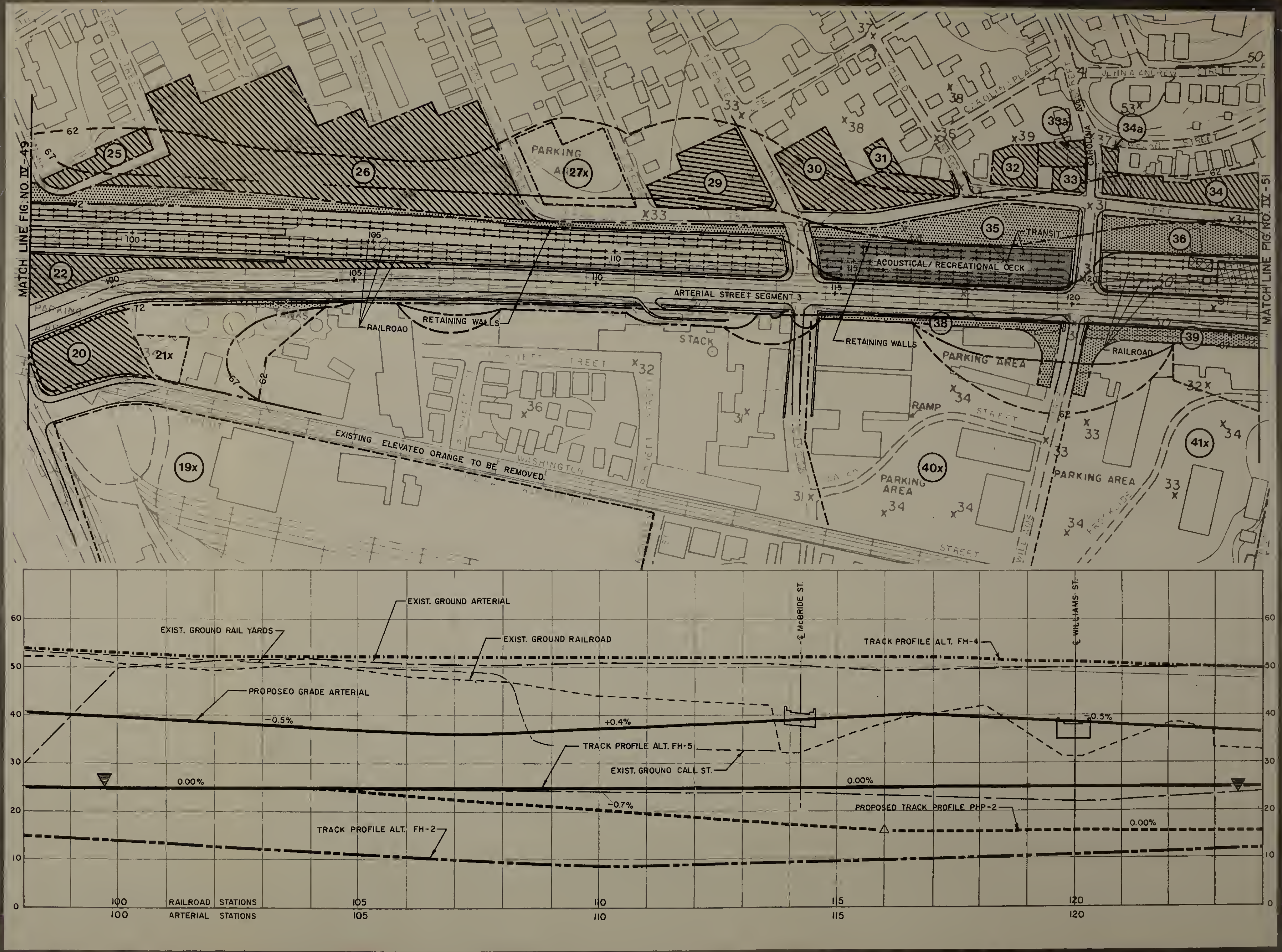
POST HEARING
DEPRESSED RAIL / TRANSIT
ARTERIAL STREET EAST
ALTERNATIVE

LEGEND

- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS
- 62 NOISE CONTOUR (62 Decibels)
- 67 " " (67 Decibels)
- 72 " " (72 Decibels)

SCALE
0 100 200 300

FIGURE
IV-50



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

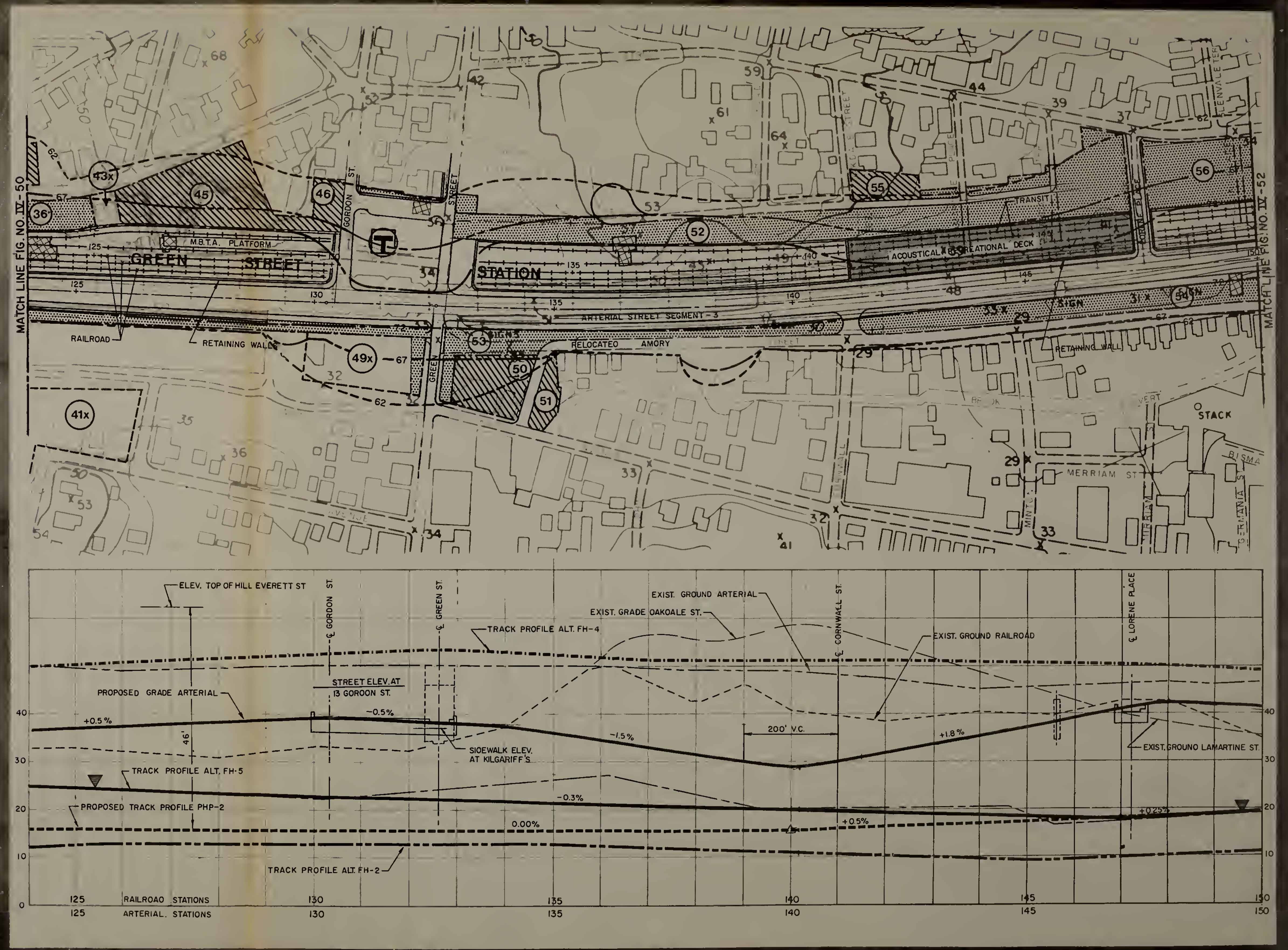
POST HEARING DEPRESSED RAIL / TRANSIT ARTERIAL STREET EAST ALTERNATIVE

LEGEND

- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS
- 62 NOISE CONTOUR (62 Decibels)
- 67 " " (67 Decibels)
- 72 " " (72 Decibels)

SCALE 0 100 200 300

FIGURE IV-51



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

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MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

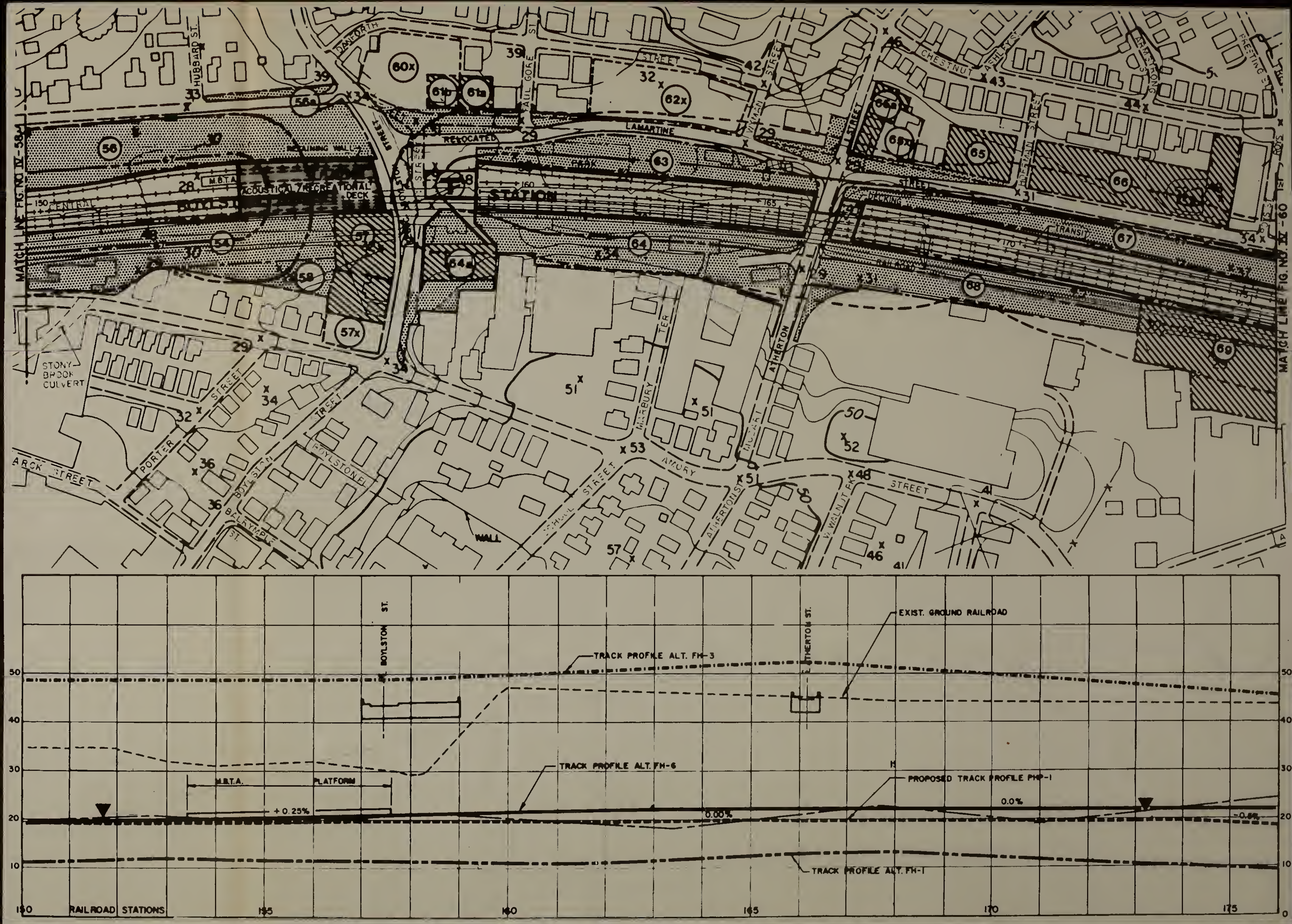
POST HEARING
DEPRESSED RAIL / TRANSIT
NO ARTERIAL STREET ALTERNATIVE

LEGEND

REDEVELOPMENT PARCELS
OPEN SPACE REDEVELOPMENT
POTENTIAL REDEVELOPMENT (BY OTHERS)
BUILDINGS TO BE REMOVED
(13) PARCEL NUMBER
M.B.T.A. & RAILROAD TRACK
PROPOSED STATIONS
62 NOISE CONTOUR (62 Decibels)
67 " " (67 Decibels)
72 " " (72 Decibels)

SCALE
NORTH
0 100 200 300

FIGURE
IV–59



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

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MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

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POST HEARING DEPRESSED RAIL / TRANSIT ARTERIAL STREET EAST ALTERNATIVE

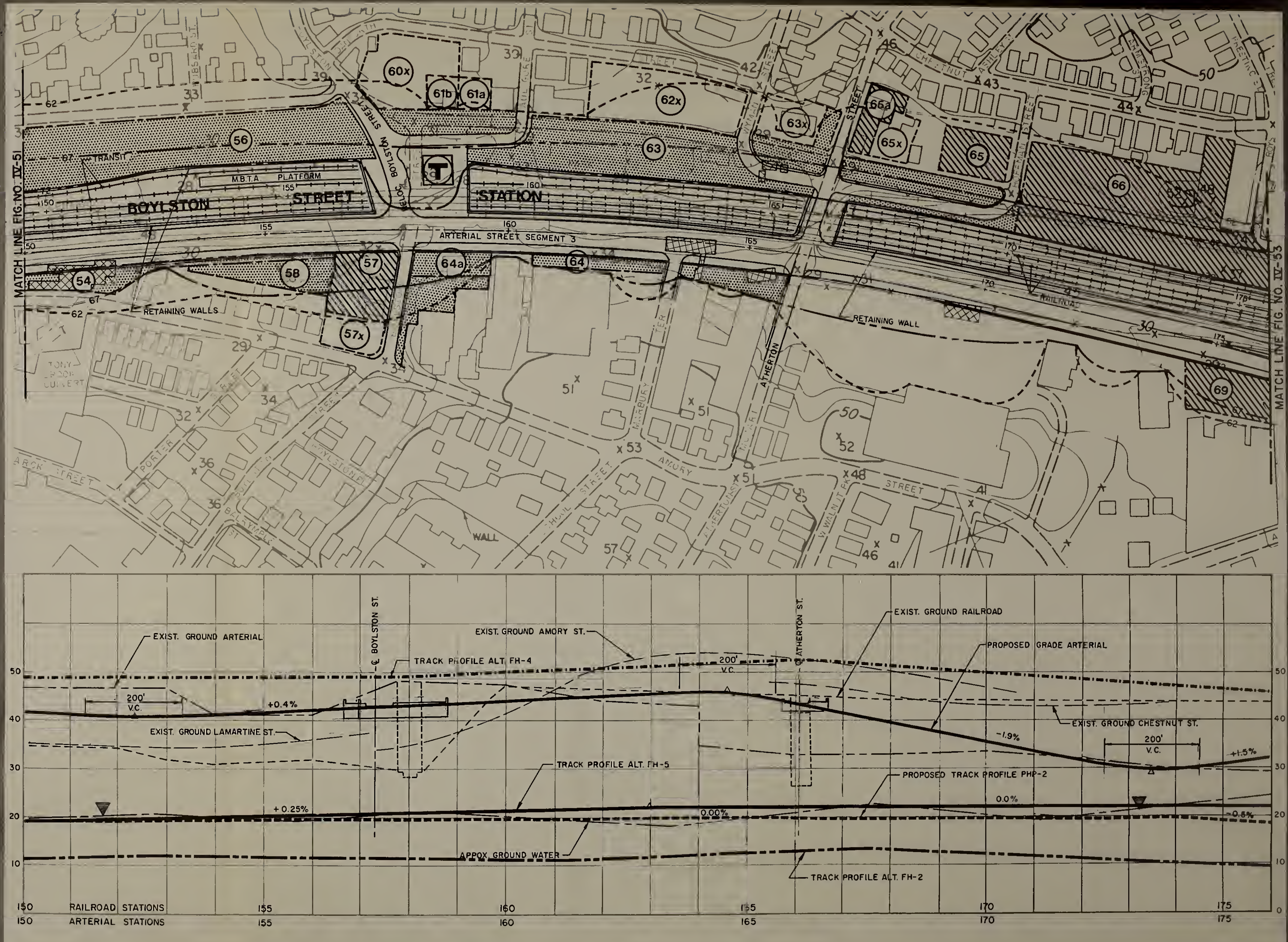
LEGEND

- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS
- 62 NOISE CONTOUR (62 Decibels)
- 67 " " (67 Decibels)
- 72 " " (72 Decibels)

SCALE 0 100 200 300

NORTH

FIGURE IV-52



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

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POST HEARING
DEPRESSED RAIL / TRANSIT
ARTERIAL STREET EAST
ALTERNATIVE

LEGEND

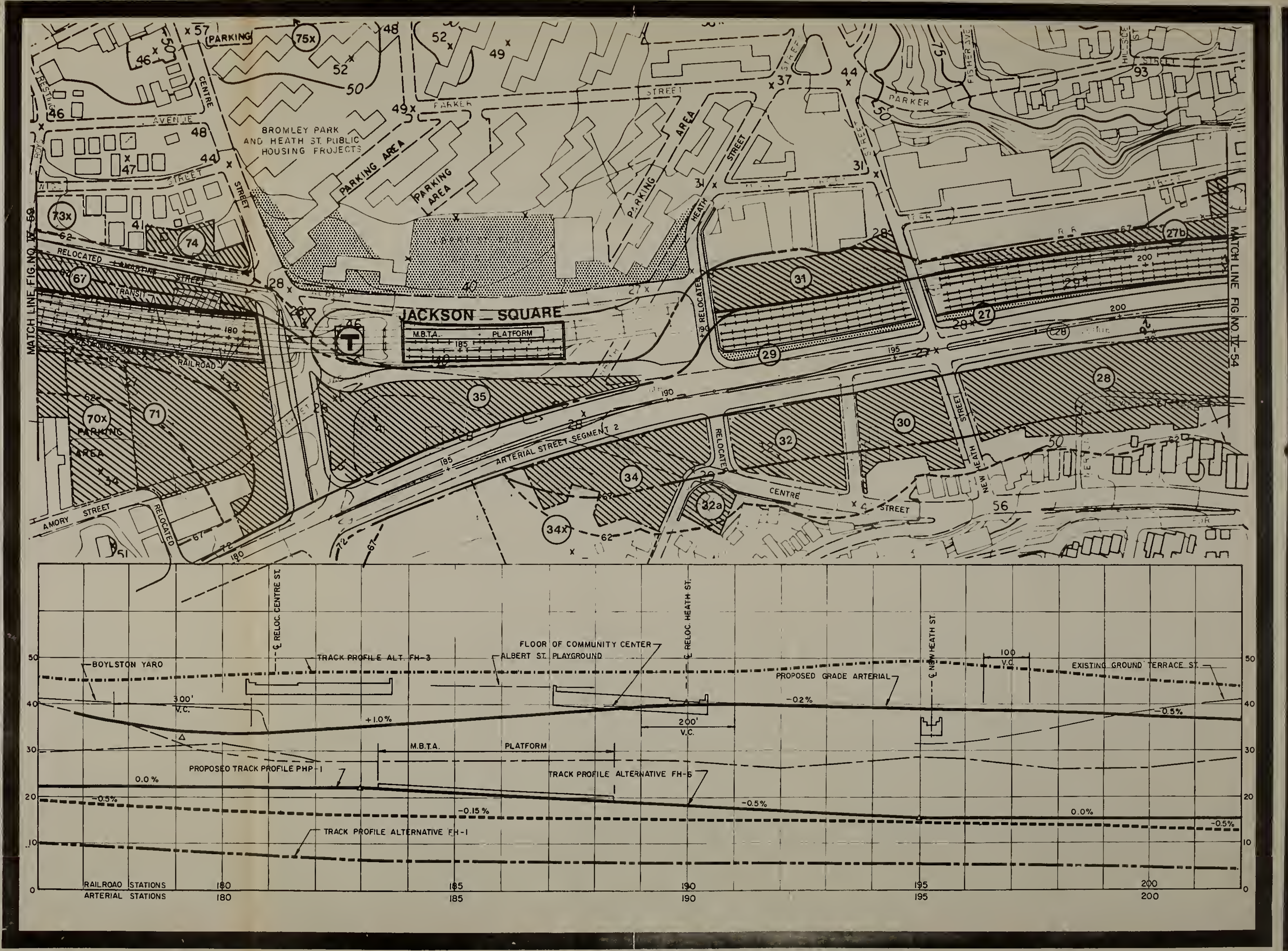
- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS
- 62 NOISE CONTOUR (62 Decibels)
- 67 " " (67 Decibels)
- 72 " " (72 Decibels)

NORTH

SCALE

0 100 200 300

FIGURE IV-60



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

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POST HEARING DEPRESSED RAIL / TRANSIT ARTERIAL STREET EAST ALTERNATIVE

LEGEND

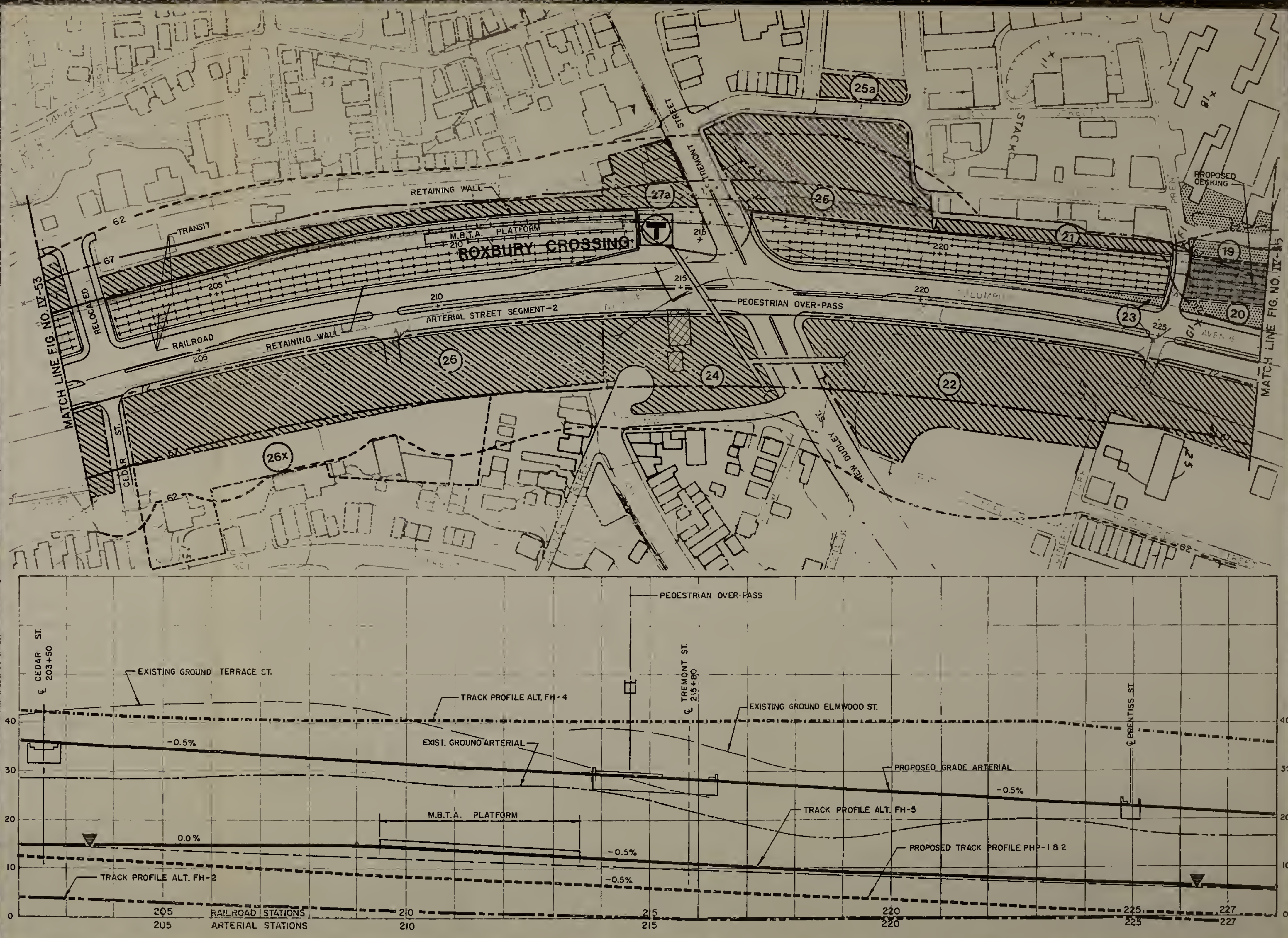
- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS
- 62 NOISE CONTOUR (62 Decibels)
- 67 " " (67 Decibels)
- 72 " " (72 Decibels)

SCALE

0 100 200 300

NORTH

FIGURE IV-54



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

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MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

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POST HEARING DEPRESSED RAIL / TRANSIT ARTERIAL STREET EAST ALTERNATIVE

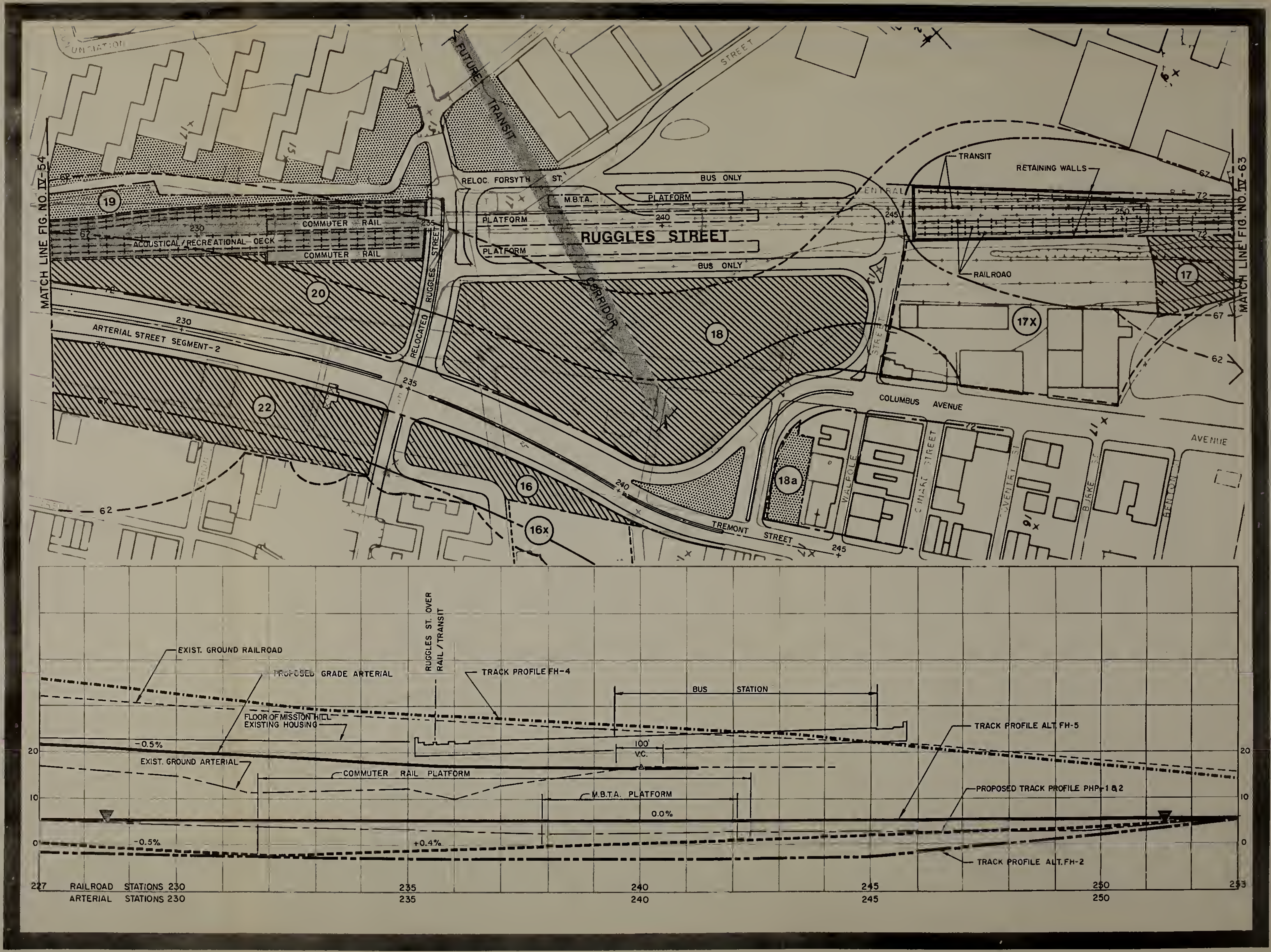
LEGEND

- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS
- 62 NOISE CONTOUR (62 Decibels)
- 67 " " (67 Decibels)
- 72 " " (72 Decibels)

SCALE

0 100 200 300

FIGURE IV-55



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

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MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

ALTERNATIVE SC-1
(SOUTH COVE to CAMDEN STREET)

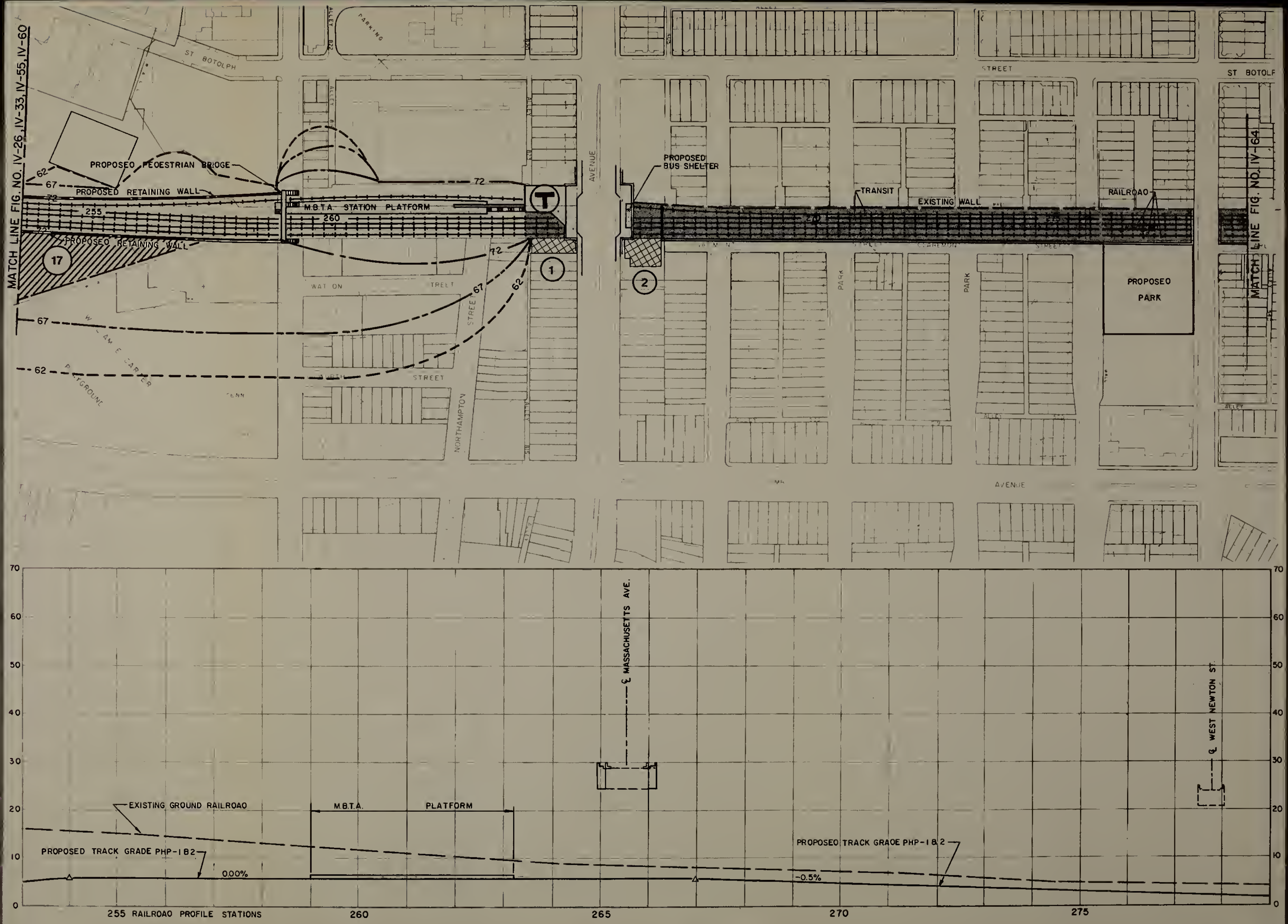
MINIMUM GRADE ADJUSTMENTS, ALL TRACKS

LEGEND

- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS

SCALE
0 100 200 300

FIGURE IV-63



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

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MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

ALTERNATIVE SC-1
(SOUTH COVE to CAMDEN STREET)

MINIMUM GRADE ADJUSTMENTS, ALL TRACKS

LEGEND

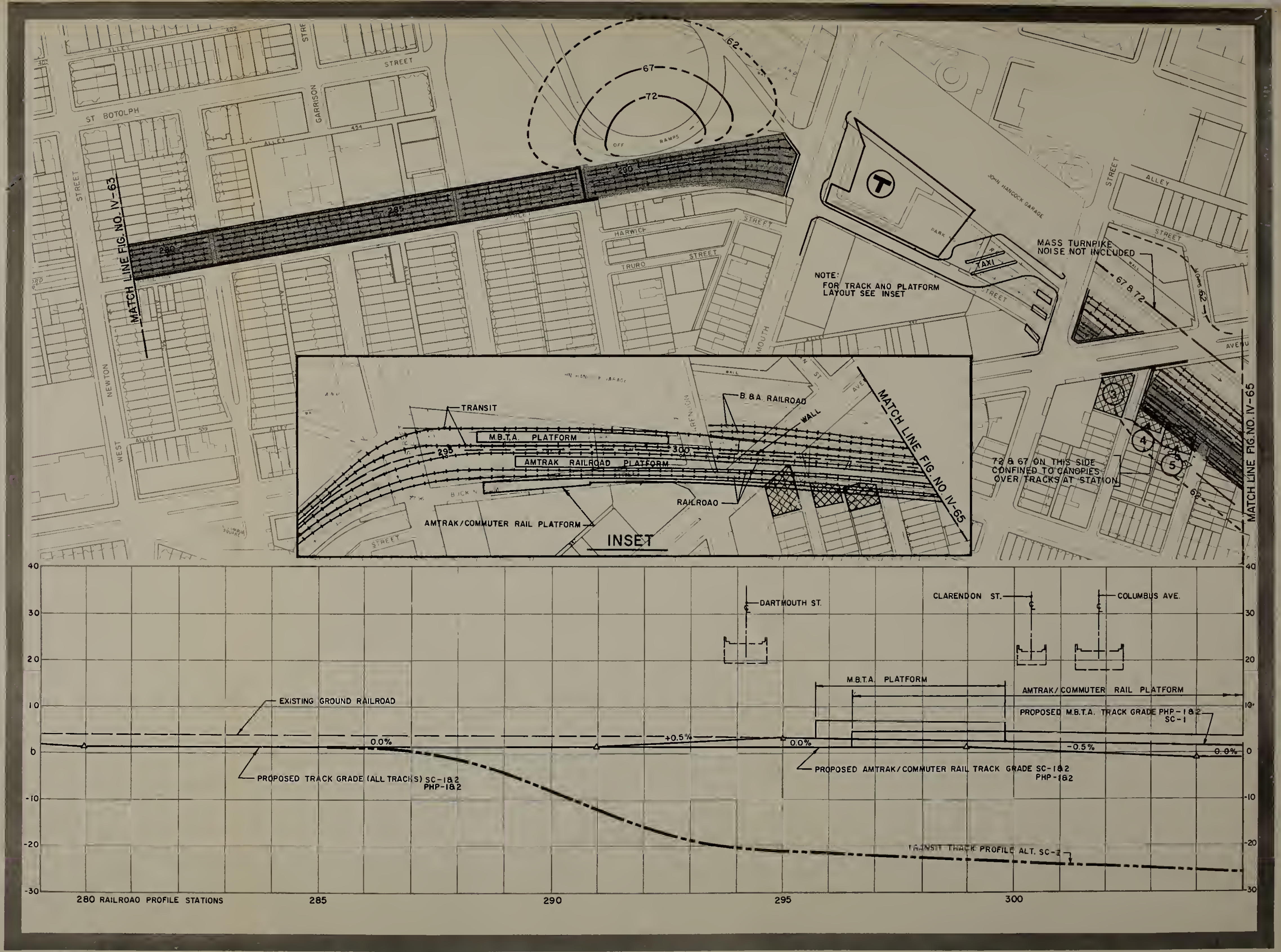
- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- 13 PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS

NORTH

SCALE

0 100 200 300

FIGURE IV-64



SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

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MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

ALTERNATIVE SC-1
(SOUTH COVE to CAMDEN STREET)

MINIMUM GRADE ADJUSTMENTS, ALL TRACKS

LEGEND

- REDEVELOPMENT PARCELS
- OPEN SPACE REDEVELOPMENT
- POTENTIAL REDEVELOPMENT (BY OTHERS)
- BUILDINGS TO BE REMOVED
- (13) PARCEL NUMBER
- M.B.T.A. & RAILROAD TRACK
- PROPOSED STATIONS

SCALE
0 100 200 300

FIGURE IV-65

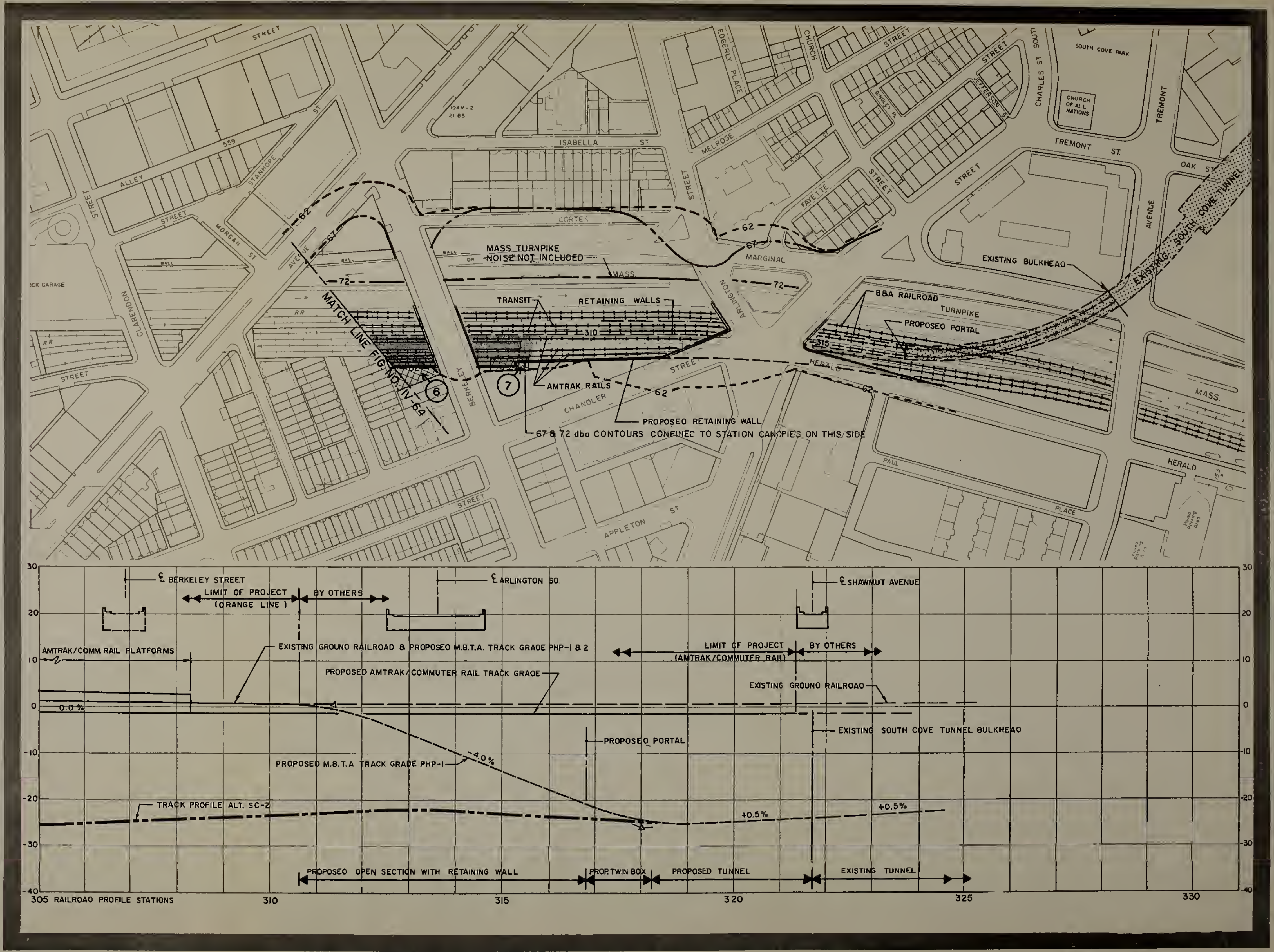


FIGURE IV-95

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

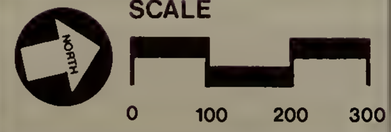
ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

FOREST HILLS STATION

TRACKS DEPRESSED

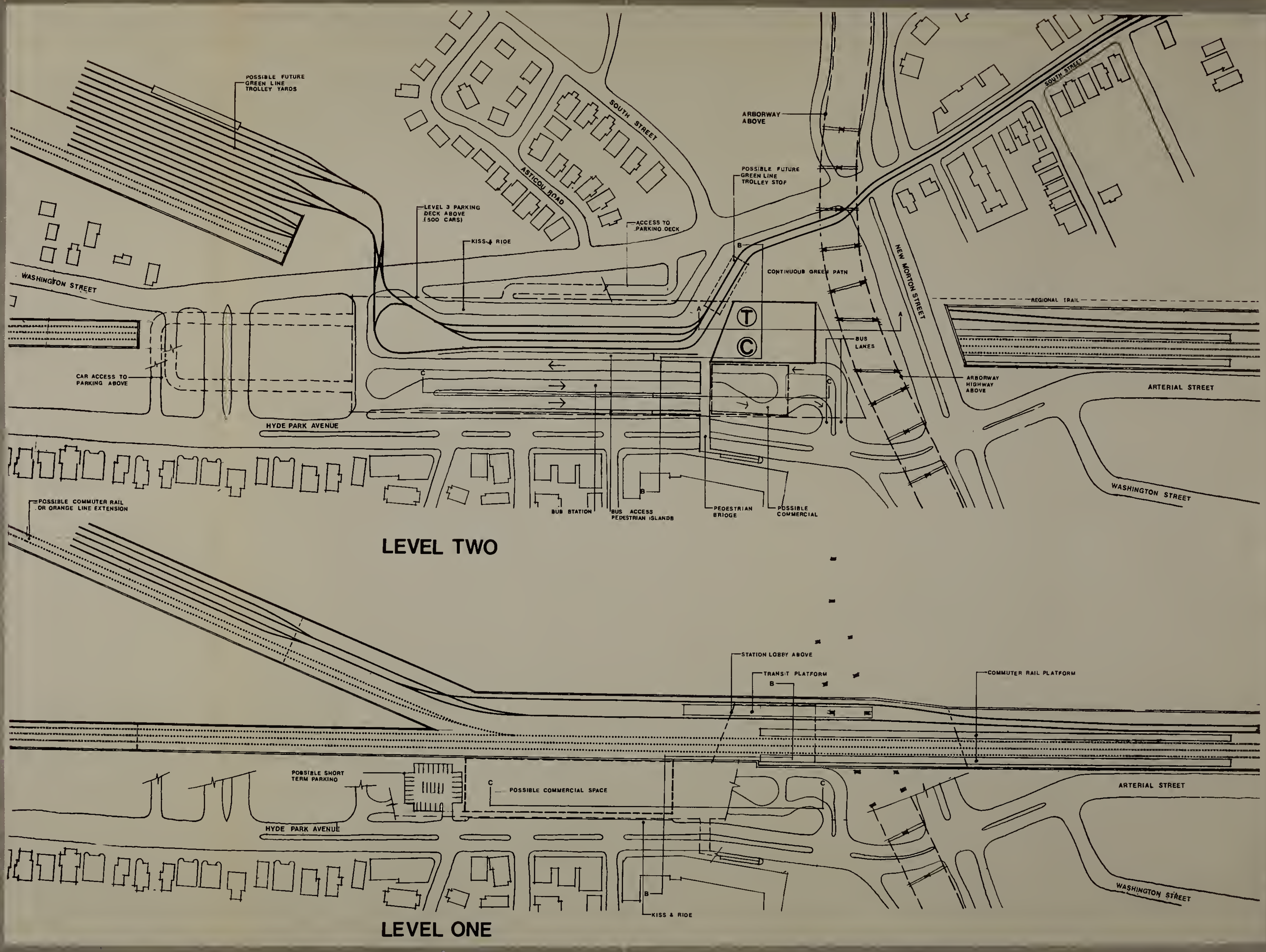
SCALE



FIGURE

IV–95

FREDERIC R. HARRIS, INC.



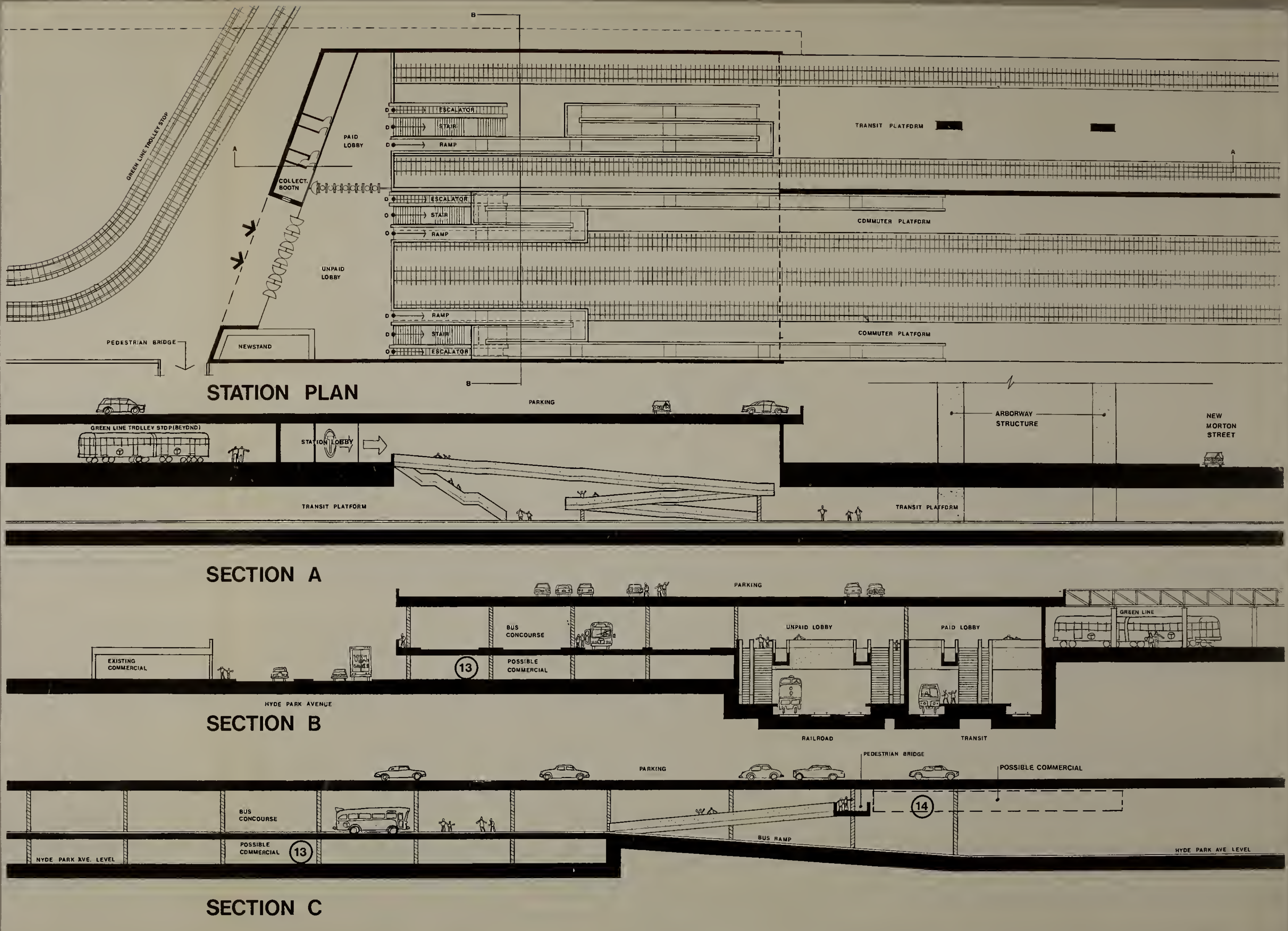
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

FOREST HILLS STATION

TRACKS DEPRESSED



SCALE

0 20 40 60

NORTH

FIGURE

IV–96

FREDERIC R. HARRIS INC.

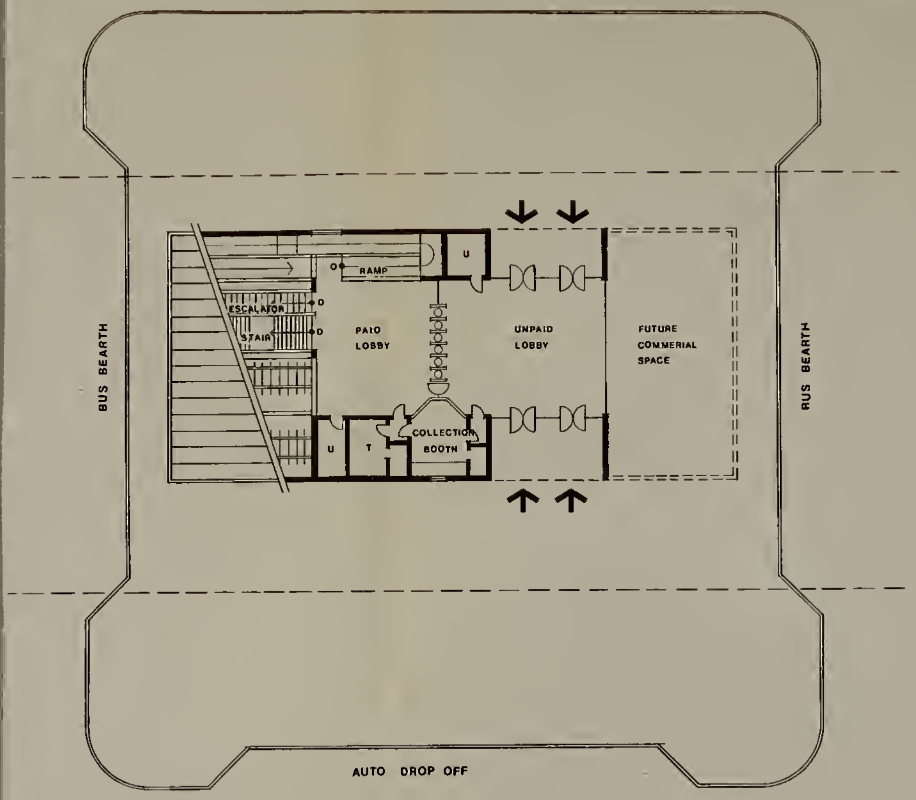
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

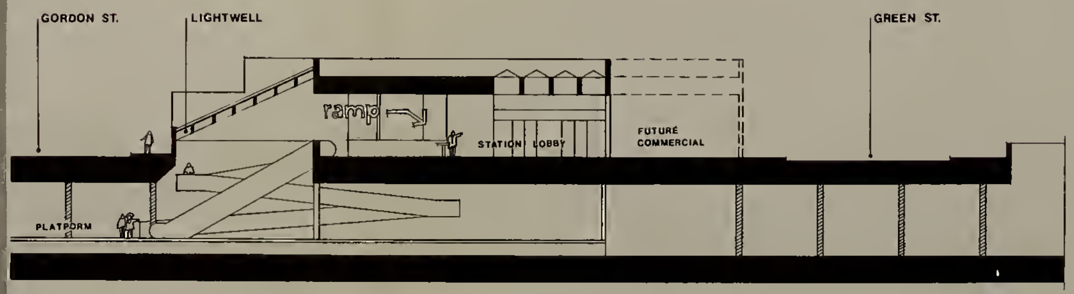
GREEN STREET STATION

TRACKS MODIFIED DEPRESSED NO ARTERIAL

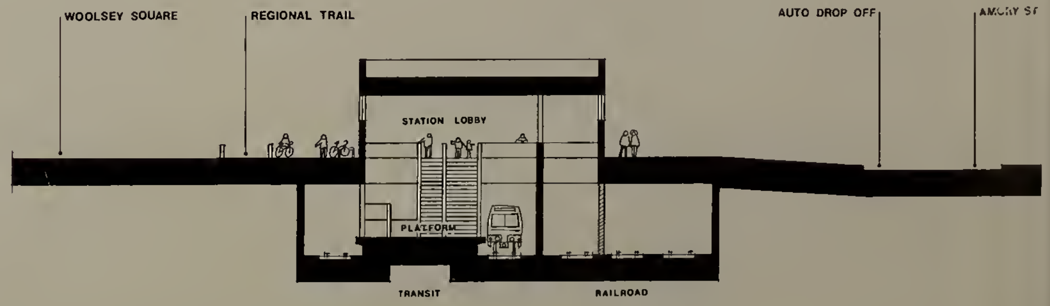


STATION PLAN

LOCATION PLAN



SECTION A



SECTION B

FIGURE IV-92

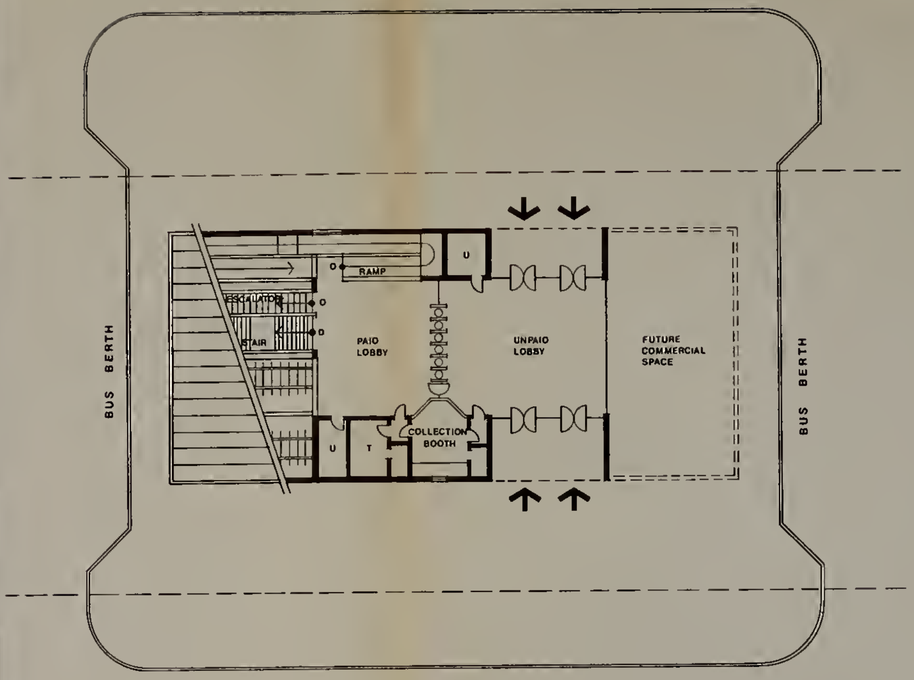
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

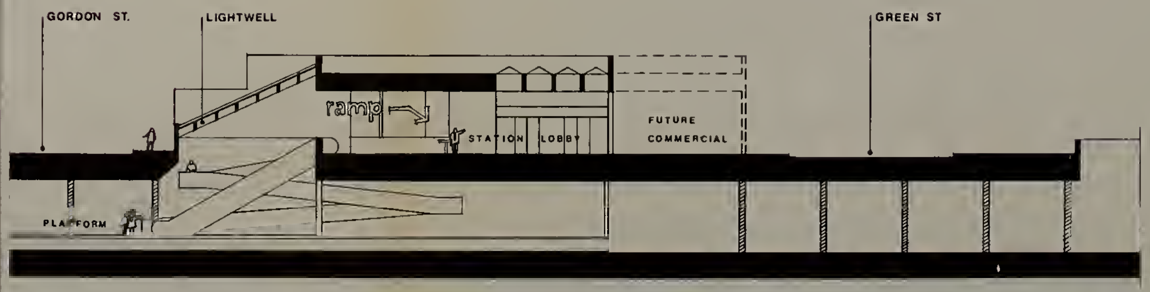
GREEN STREET STATION

TRACKS MODIFIED DEPRESSED ARTERIAL EAST

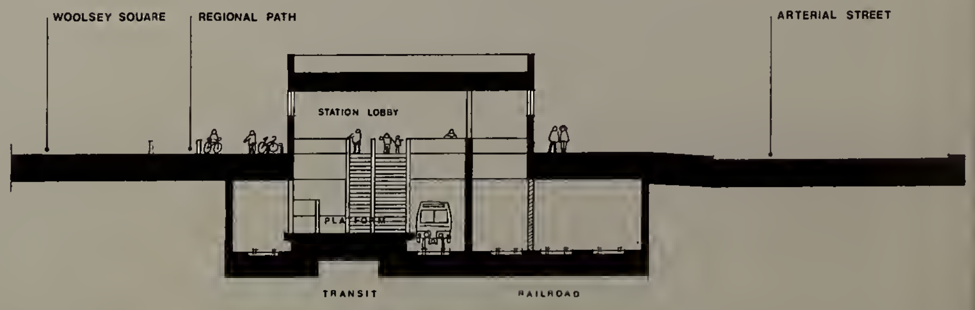


STATION PLAN

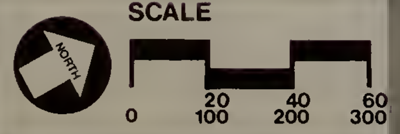
LOCATION PLAN



SECTION A



SECTION B



FIGURE

IV–90

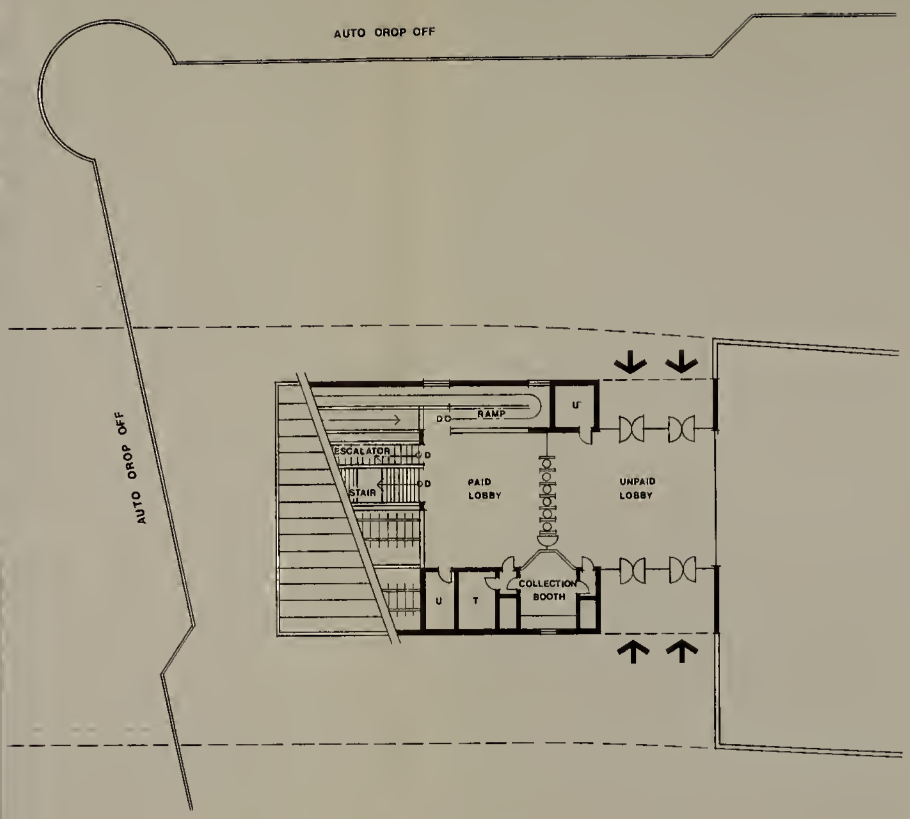
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

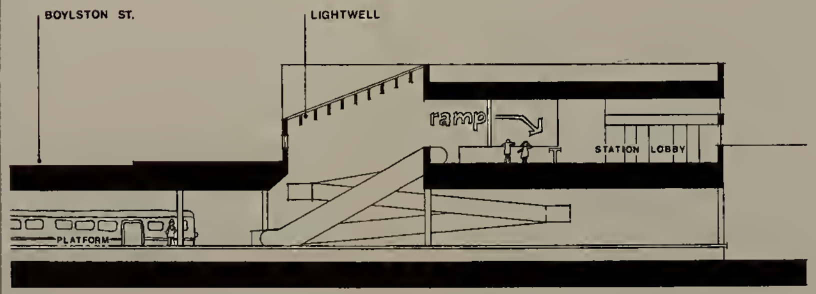
BOYLSTON STREET STATION

TRACKS MODIFIED DEPRESSED
NO ARTERIAL

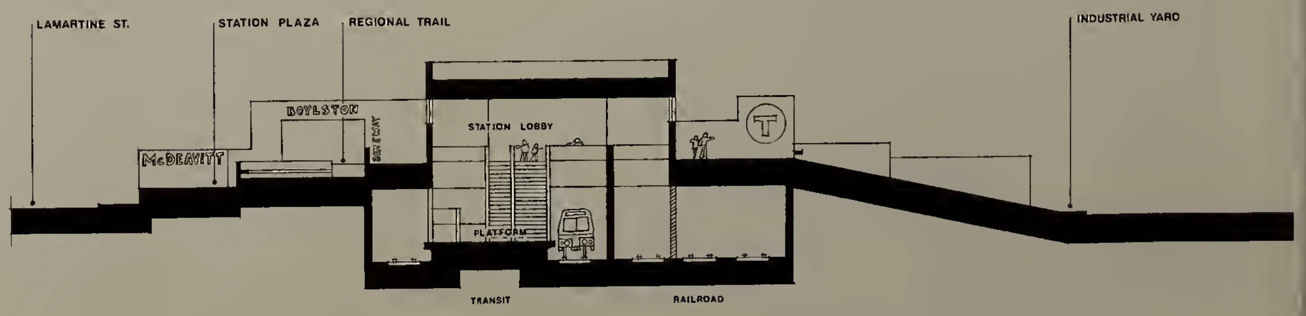


STATION PLAN

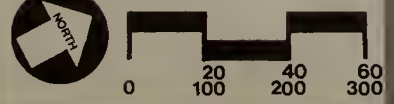
LOCATION PLAN



SECTION A



SECTION B



FIGURE

IV-87

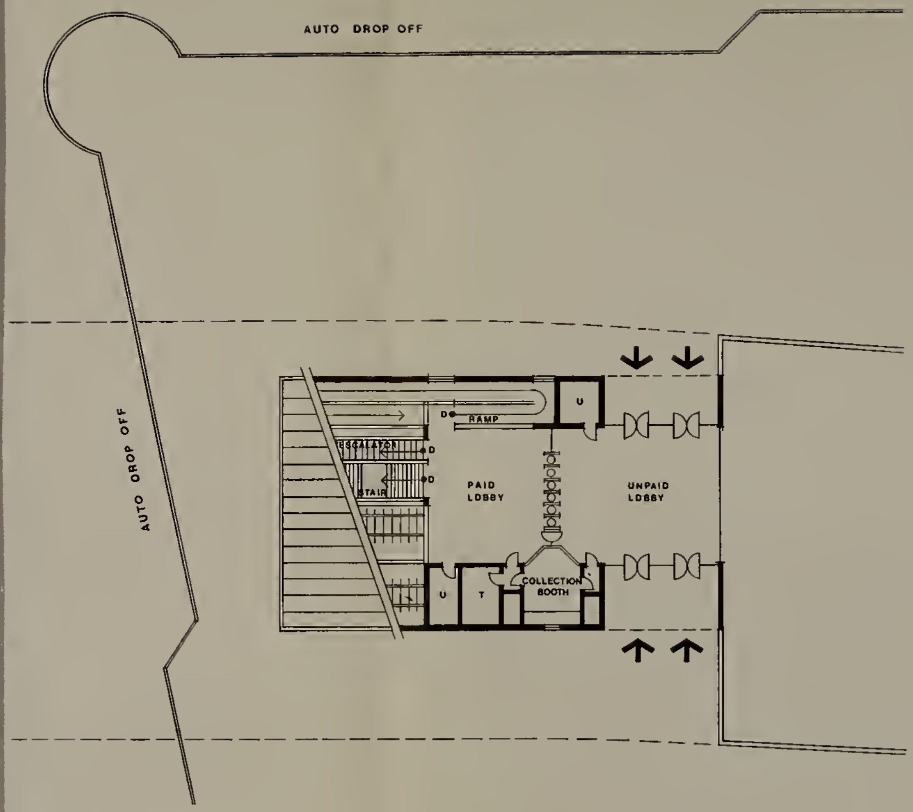
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

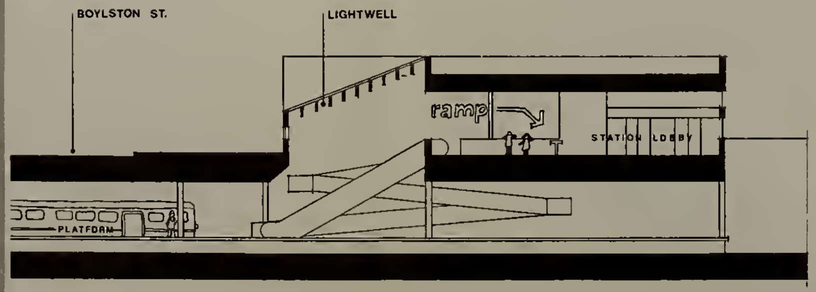
BOYLSTON STREET STATION

TRACKS MODIFIED DEPRESSED ARTERIAL EAST

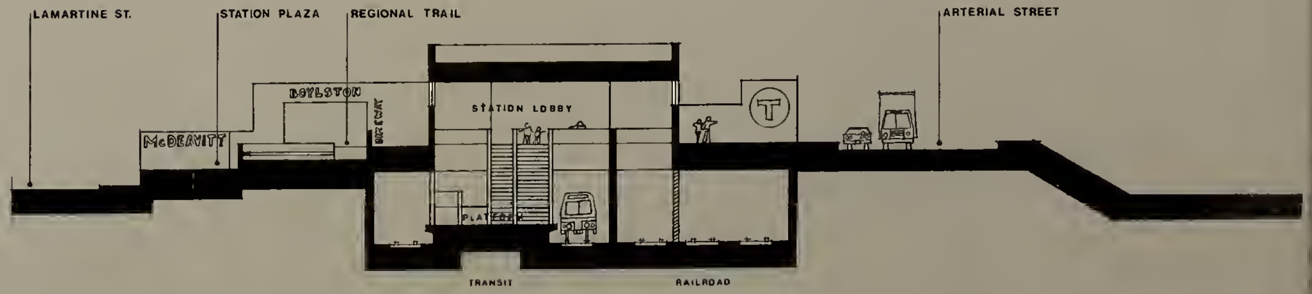


STATION PLAN

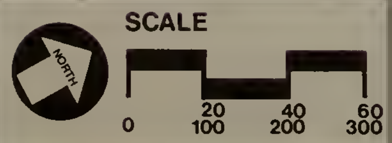
LOCATION PLAN



SECTION A



SECTION B



FIGURE

IV-85

FREDERIC R. HARRIS INC

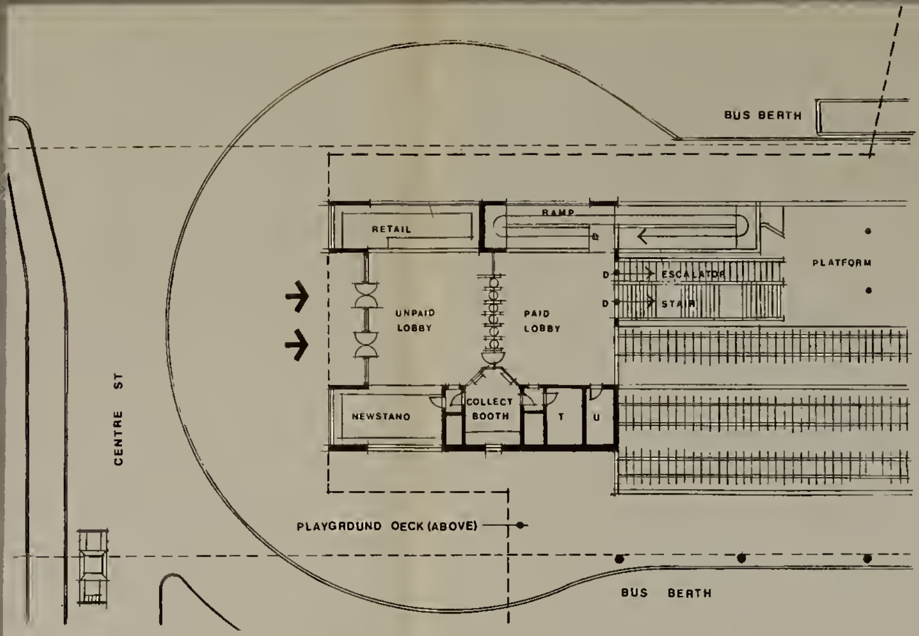
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

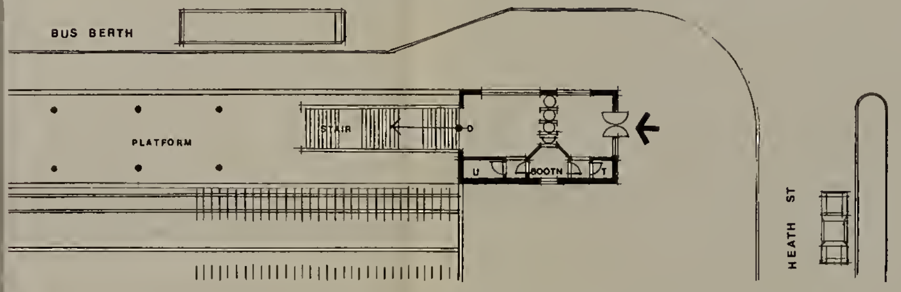
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

JACKSON SQUARE STATION

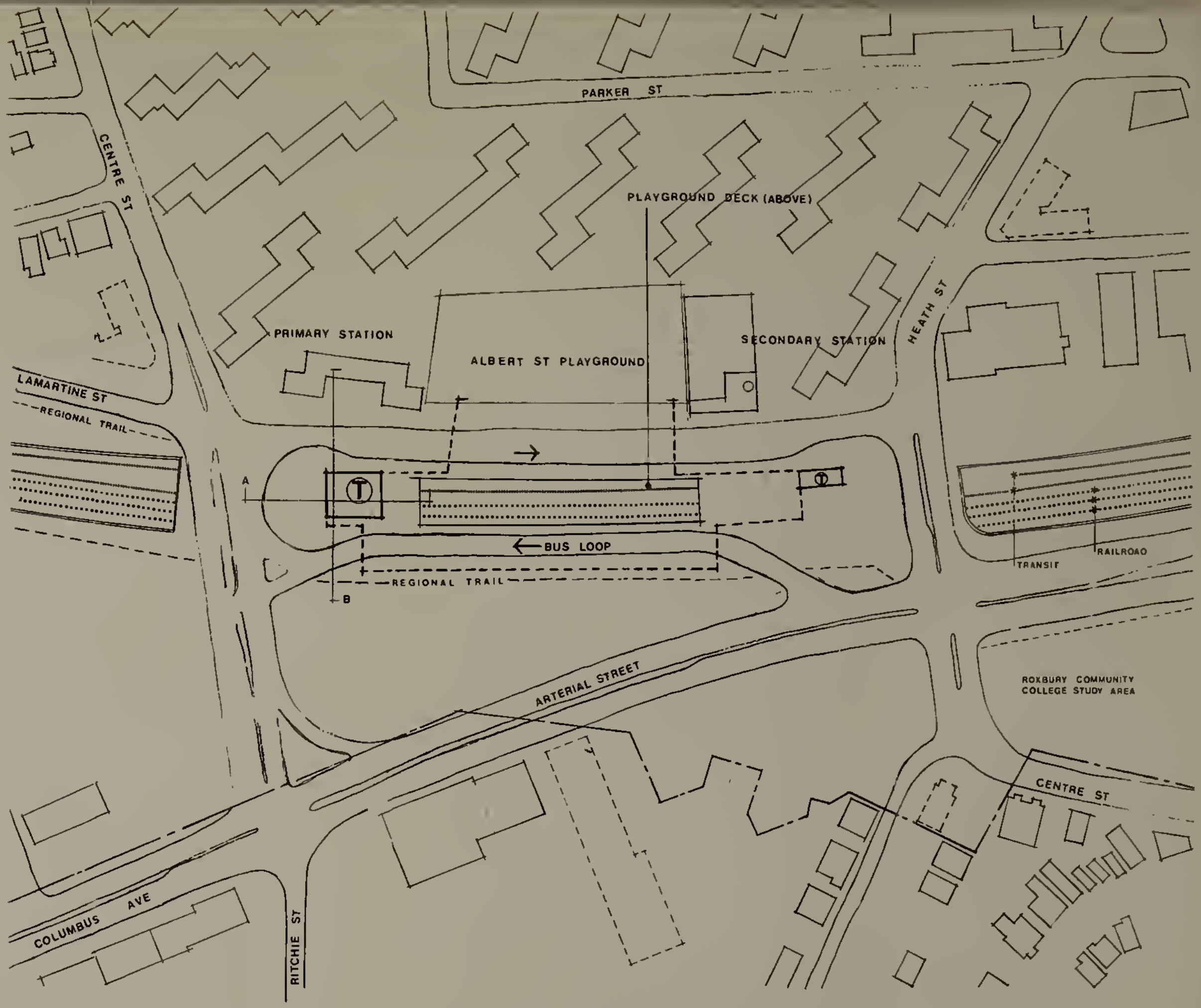
TRACKS MODIFIED DEPRESSED ARTERIAL TO JACKSON SQUARE



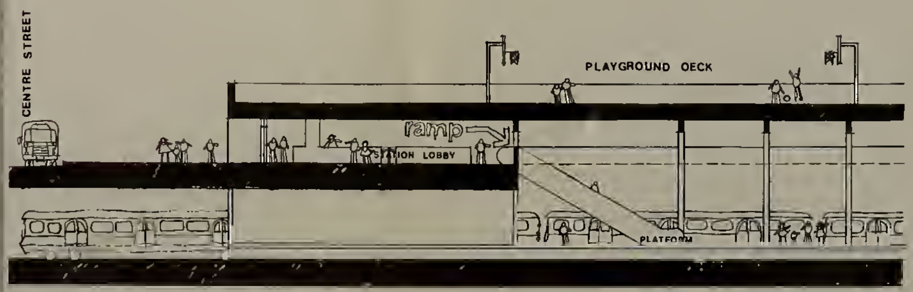
PRIMARY STATION PLAN



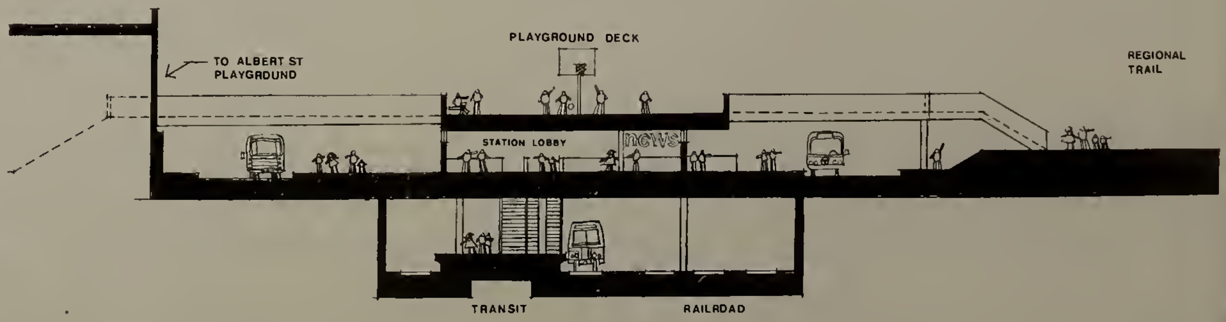
SECONDARY STATION PLAN



LOCATION PLAN



SECTION A



SECTION B

NORTH

SCALE

0 | 20 100 | 40 200 | 60 300

FIGURE IV-83

FREDERIC R. HARRIS INC

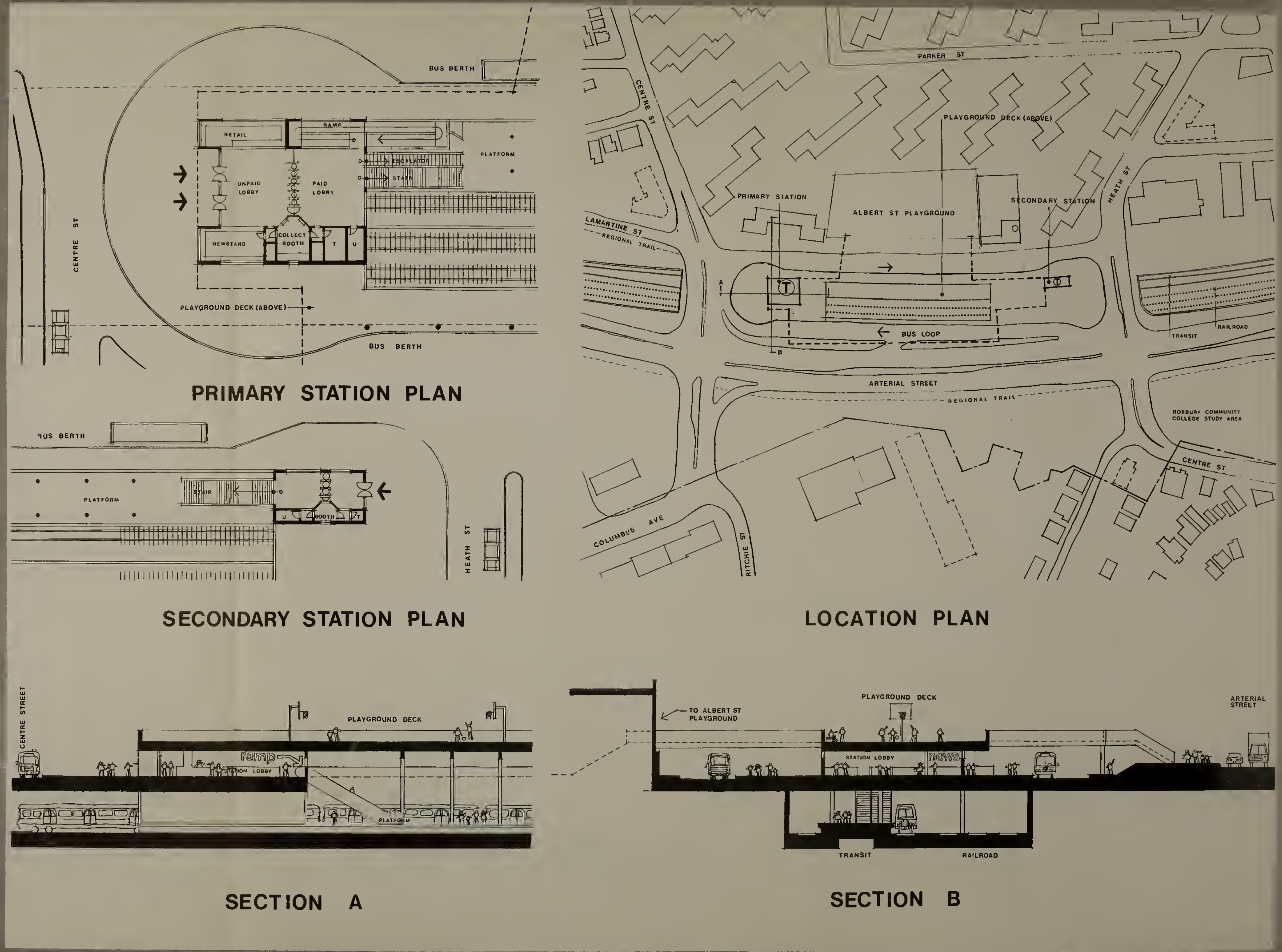
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

JACKSON SQUARE STATION

TRACKS MODIFIED DEPRESSED ARTERIAL THROUGH JACKSON SQUARE



SCALE

0 20 40 60
100 200 300

NORTH

FIGURE IV-81

FREDERIC R. HARRIS INC

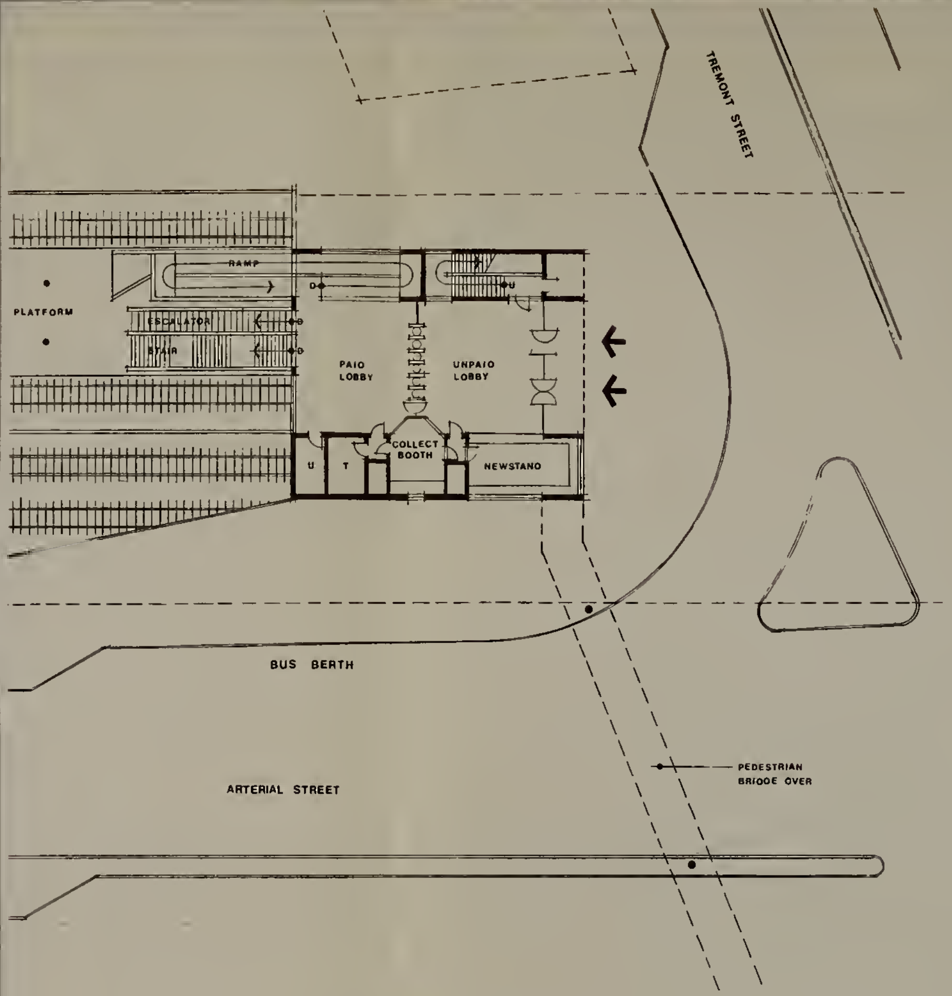
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

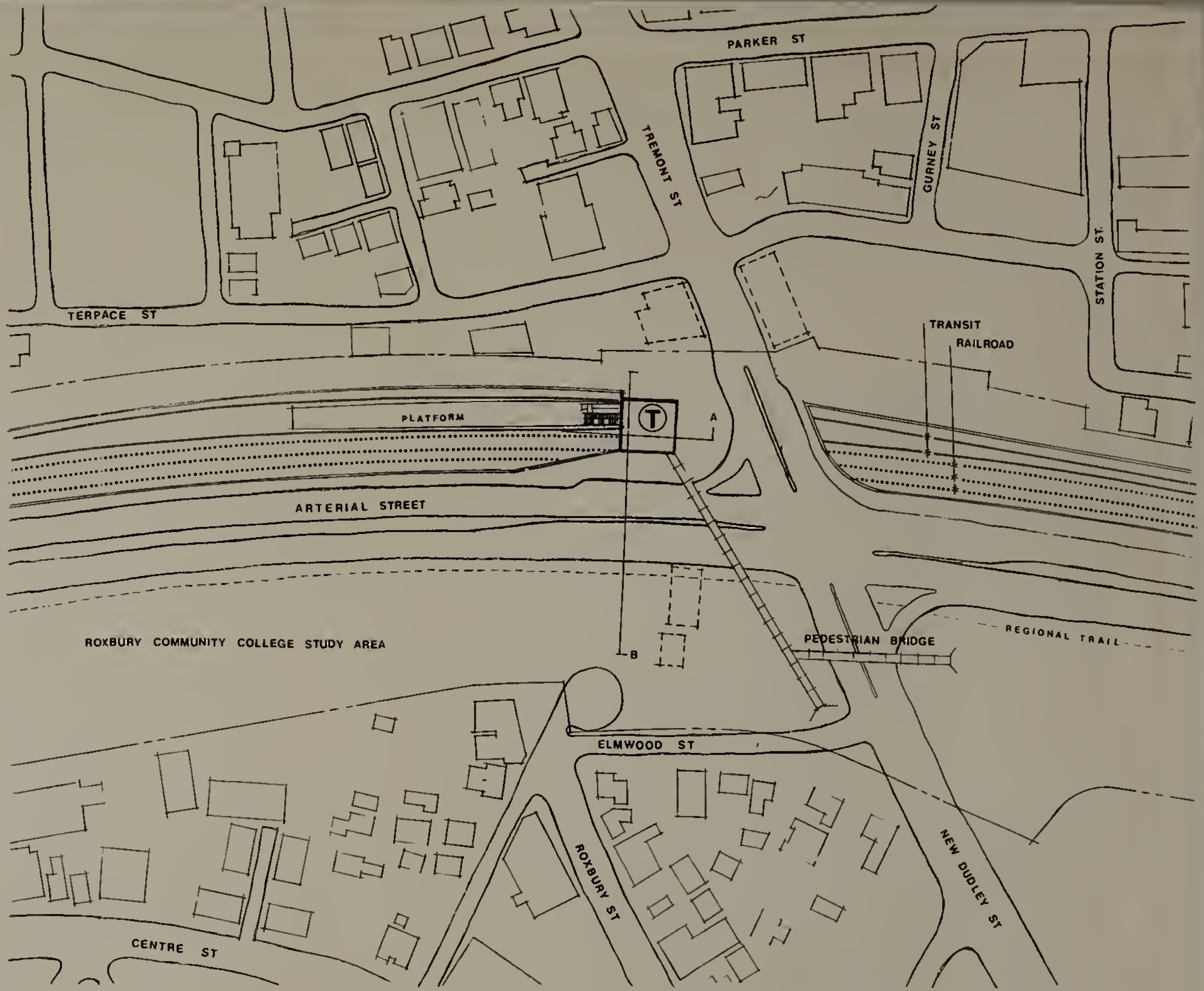
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

ROXBURY CROSSING STATION

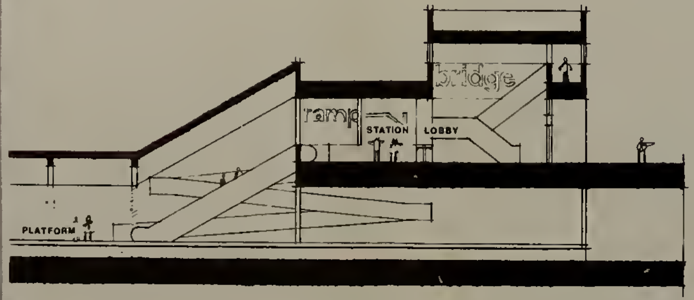
TRACKS MODIFIED DEPRESSED



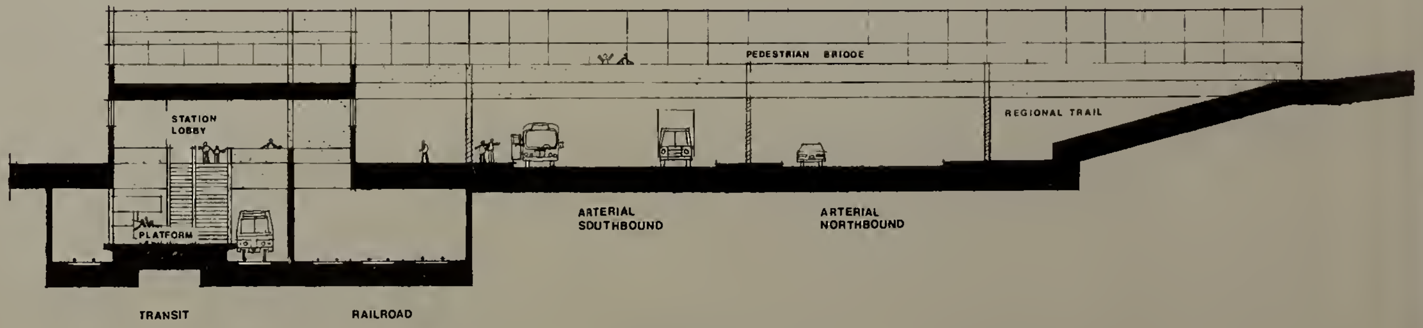
STATION PLAN



LOCATION PLAN



SECTION A



SECTION B

NORTH

SCALE

0 20 40 60
100 200 300

FIGURE IV-79

FREDERIC R HARRIS INC

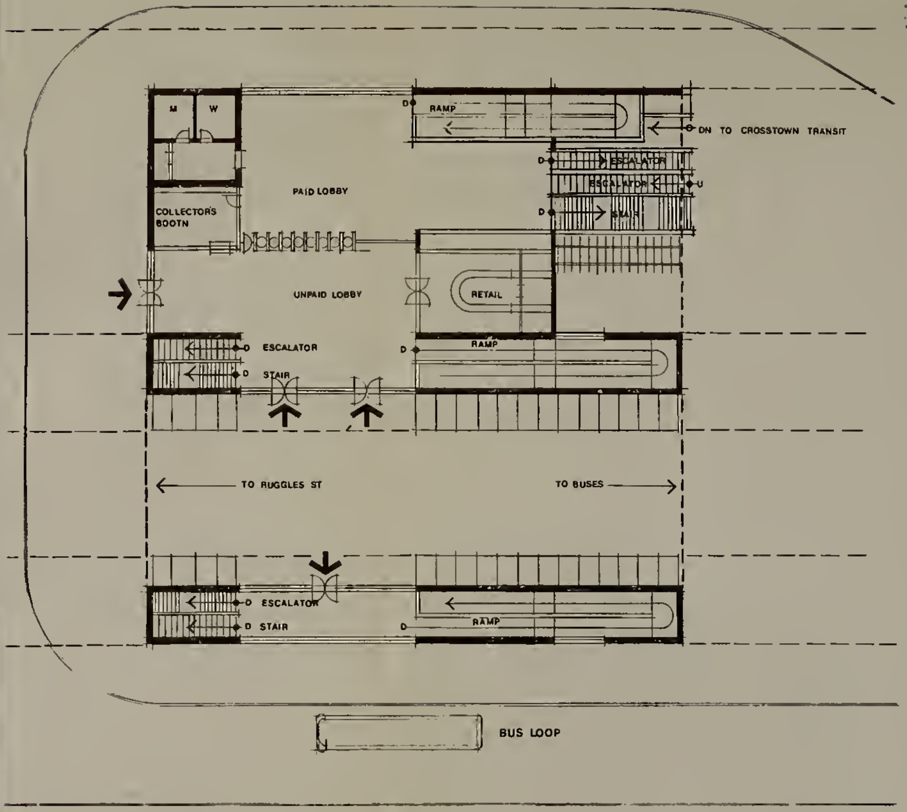
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

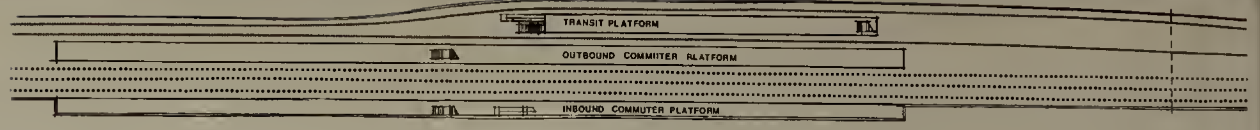
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

RUGGLES STREET

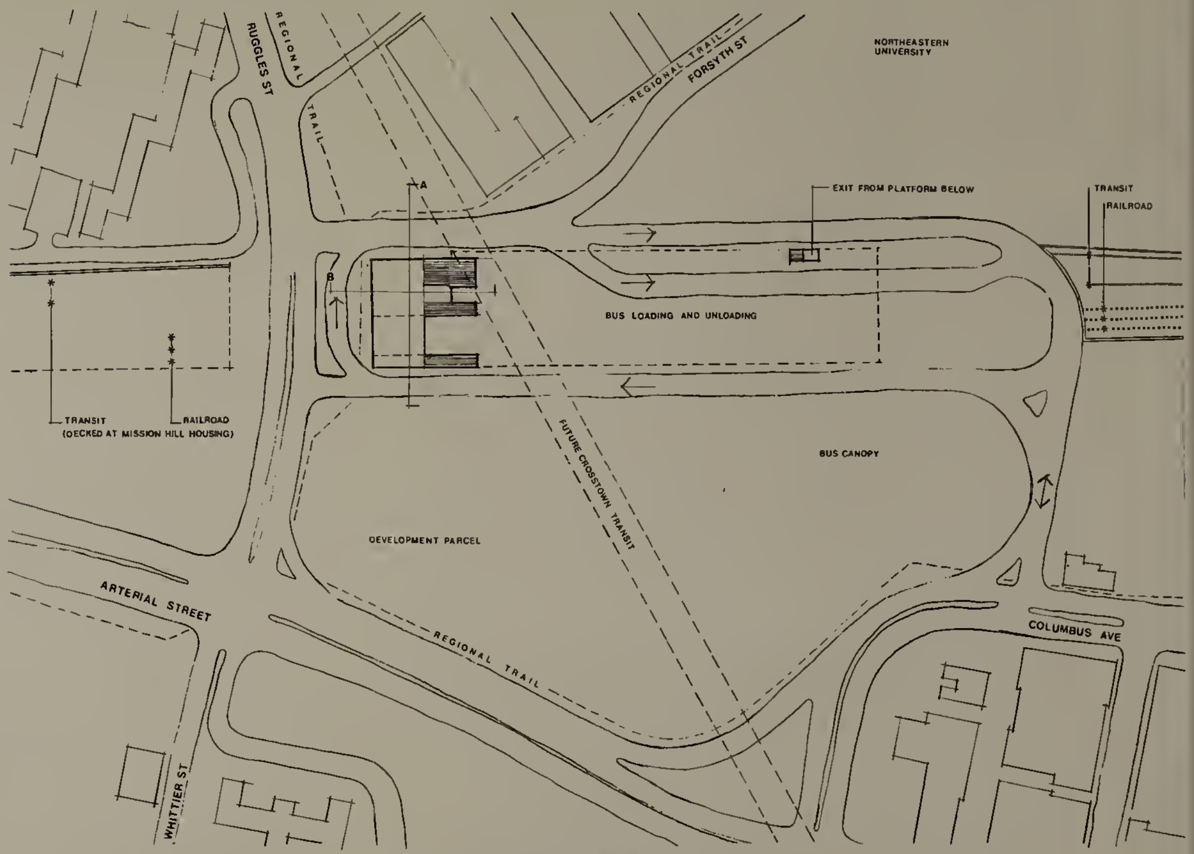
TRACKS MODIFIED DEPRESSED



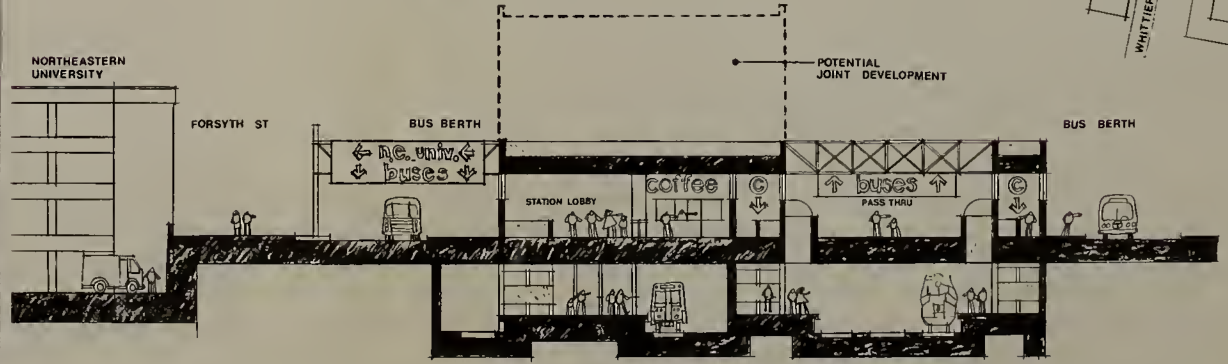
STATION PLAN



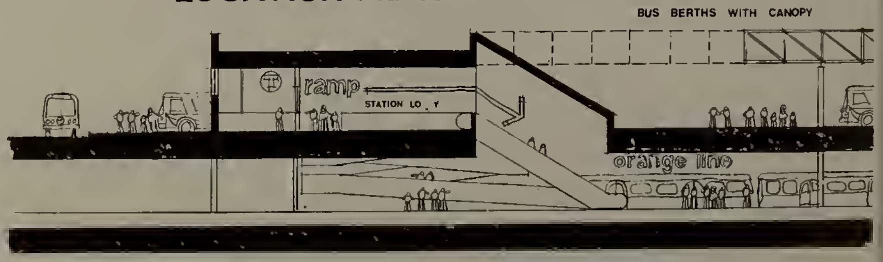
PLATFORM PLAN



LOCATION PLAN



SECTION A



SECTION B

SCALE

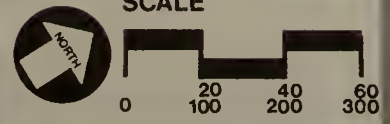


FIGURE IV-77

FREDERIC R. HARRIS INC

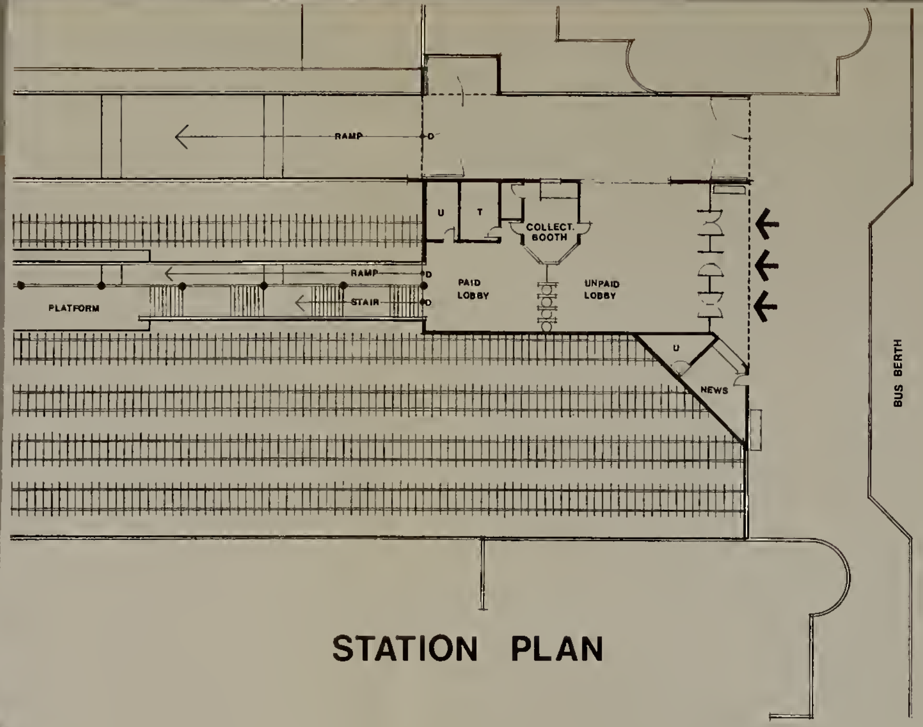
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

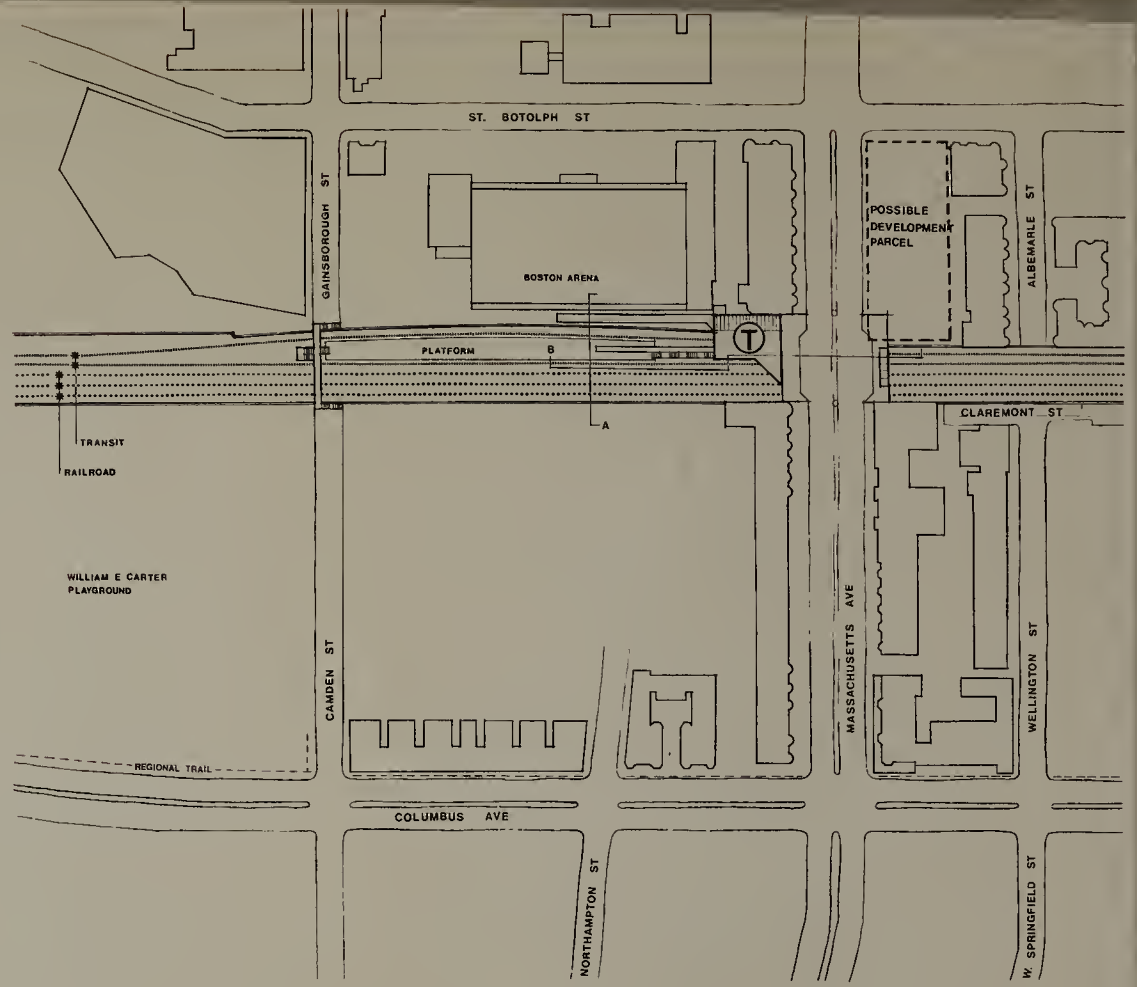
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

MASS AVENUE STATION

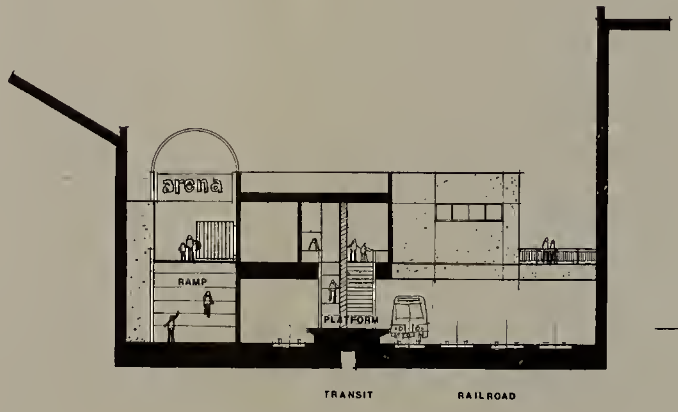
TRACKS AT EXISTING GRADE



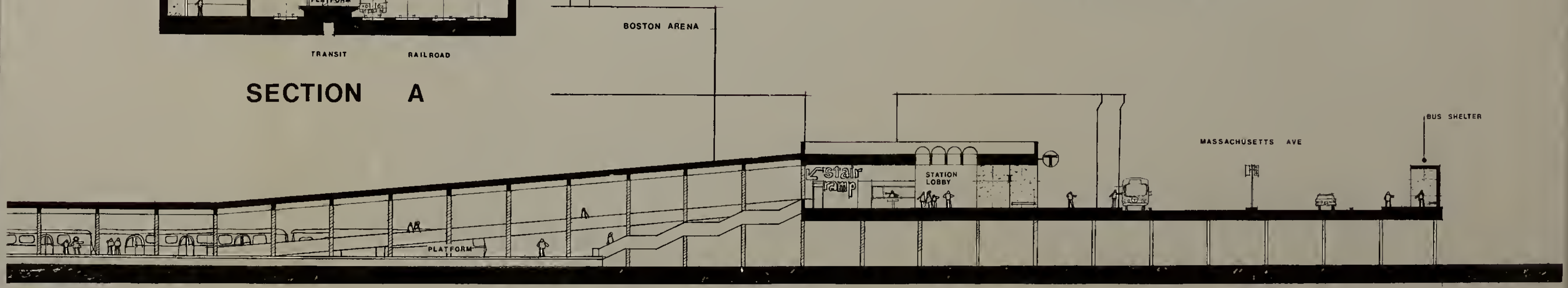
STATION PLAN



LOCATION PLAN



SECTION A



SECTION B

SCALE

0 20 40 60
0 100 200 300

NORTH

FIGURE IV-74

FREDERIC R. HARRIS INC.

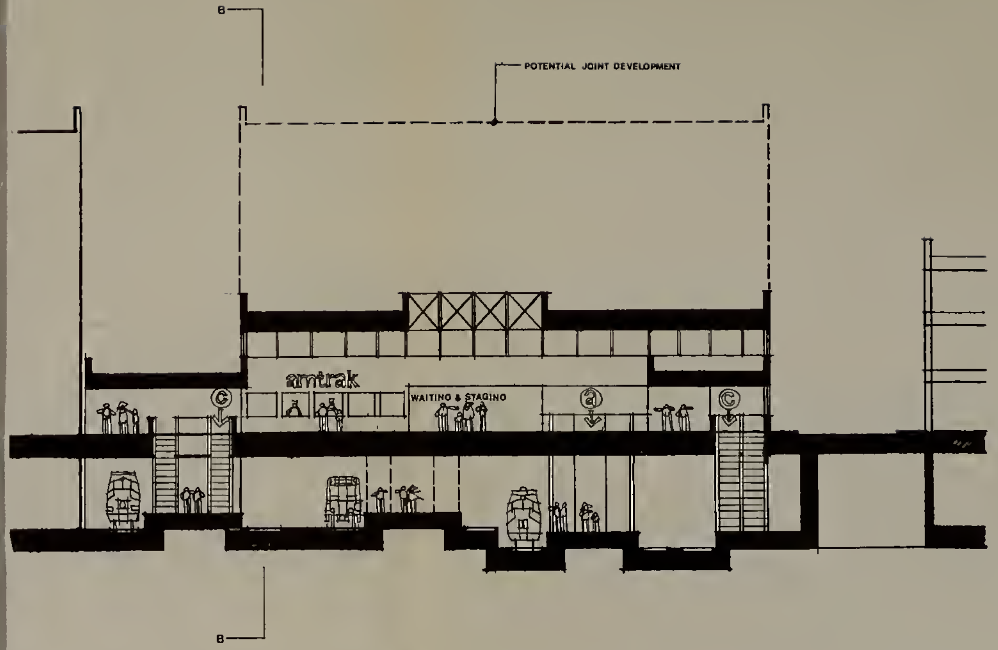
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

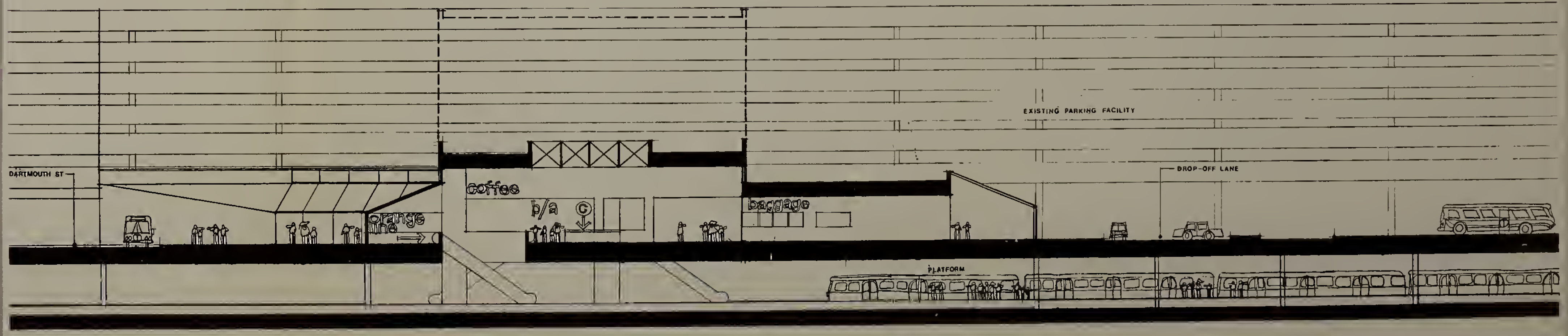
BACK BAY STATION

RAIL AND TRANSIT AT GRADE



SECTION A

LOCATION PLAN



SECTION B

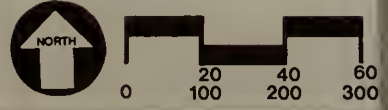


FIGURE IV-70

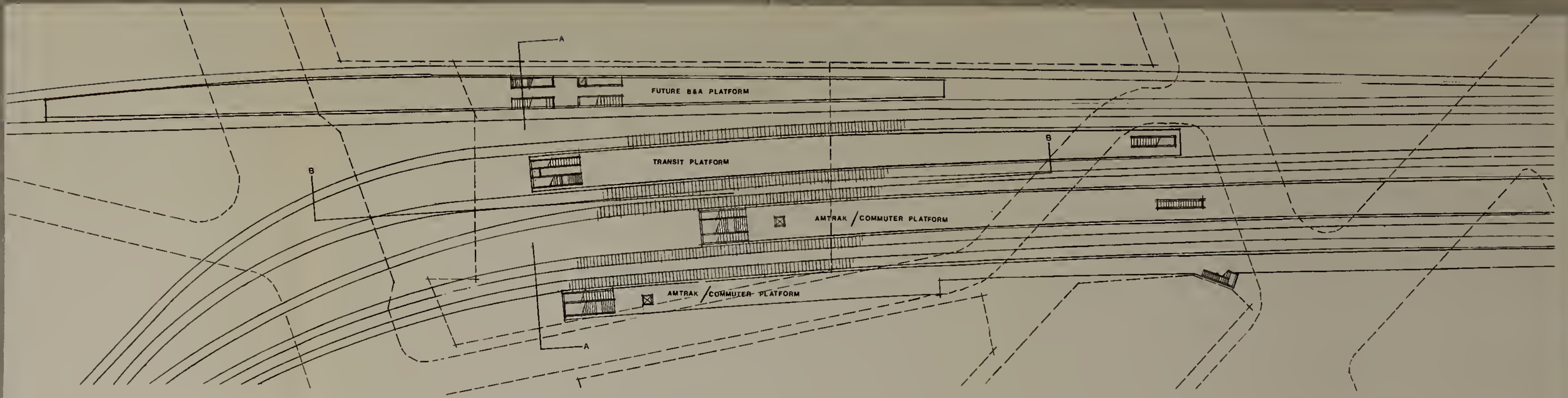
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

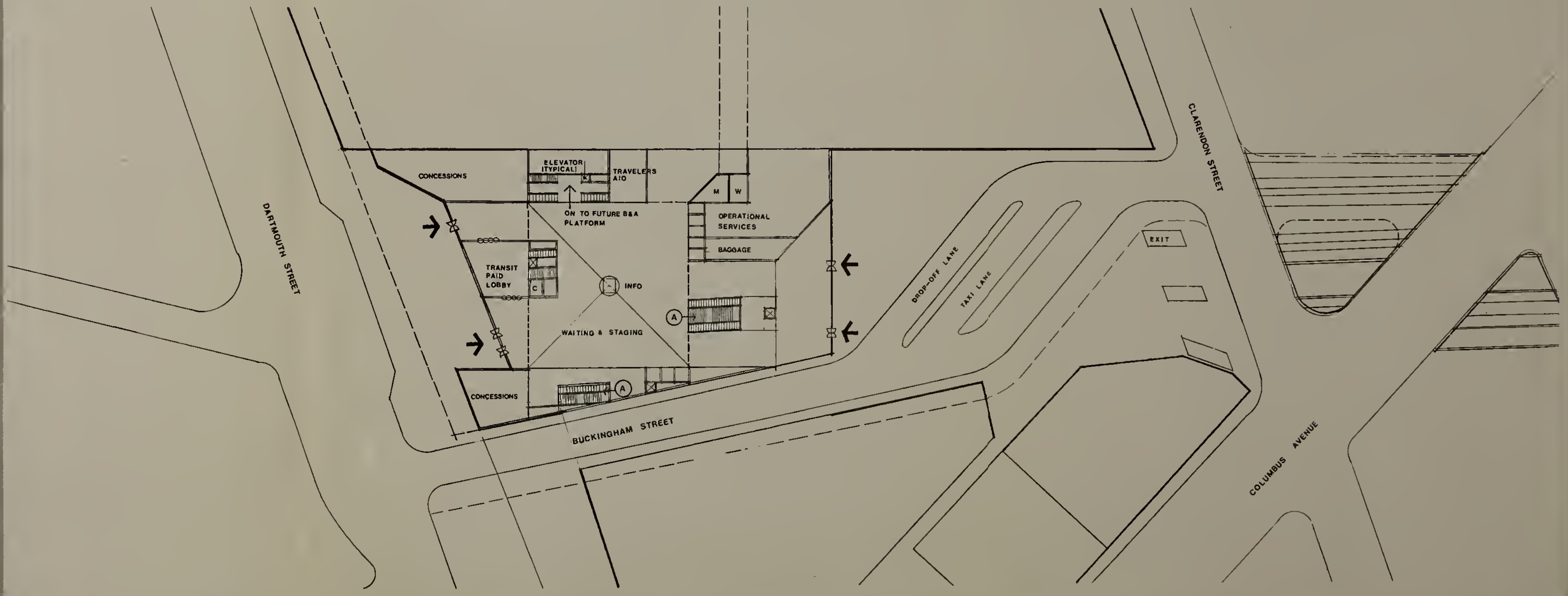
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BACK BAY STATION

RAIL AND TRANSIT AT GRADE



PLATFORM PLAN



STATION PLAN

NORTH

SCALE

0 40 80 120

FIGURE IV-71

FREDERIC R HARRIS INC

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

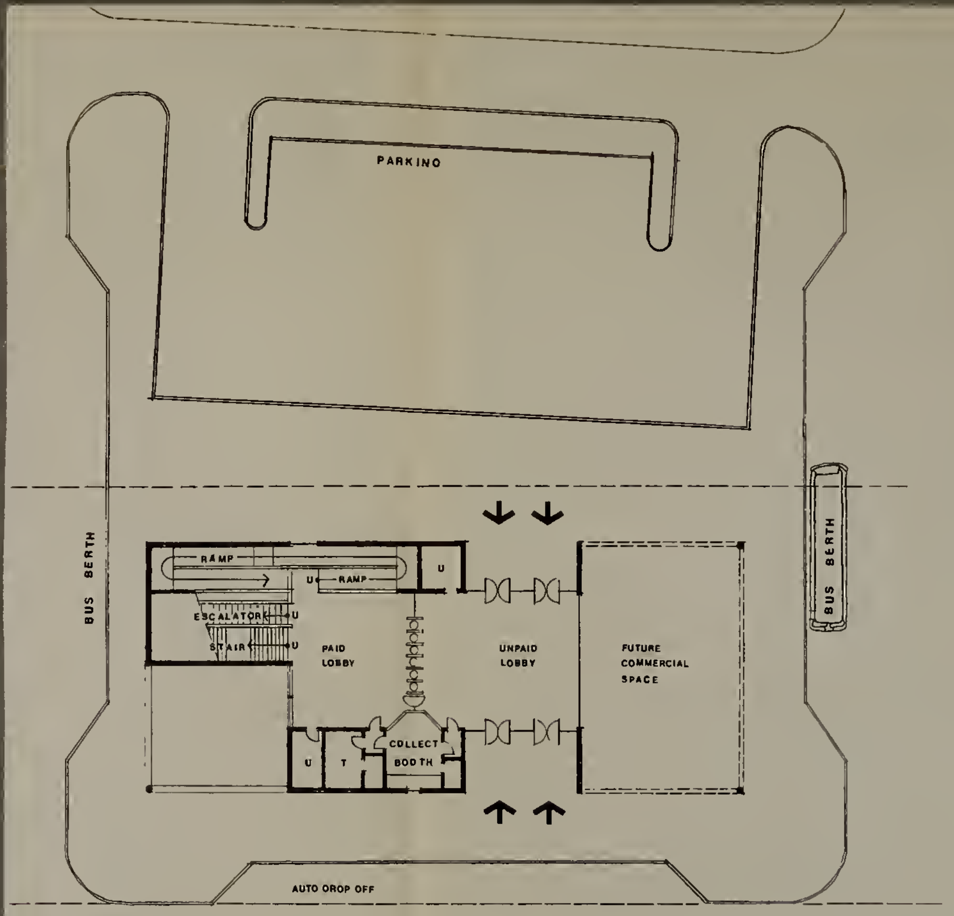
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

GREEN STREET STATION

TRACKS ELEVATED
NO ARTERIAL

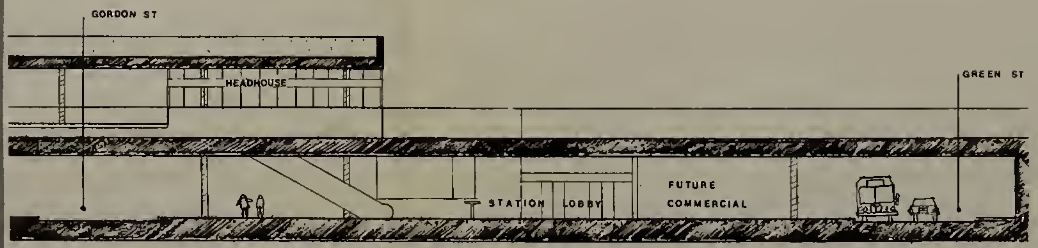
ELEVATED PROTOTYPE FOR

BOYLSTON ST
JACKSON SQUARE
ROXBURY CROSSING

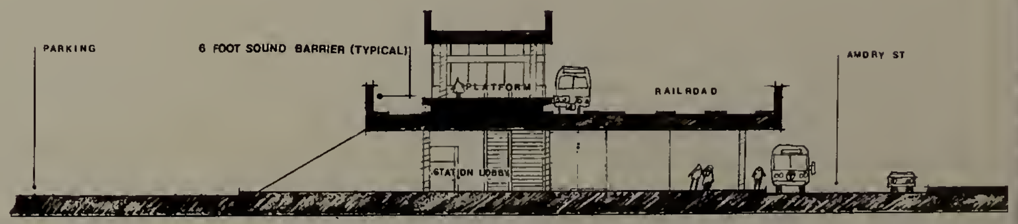


STATION PLAN

LOCATION PLAN



SECTION A



SECTION B

SCALE

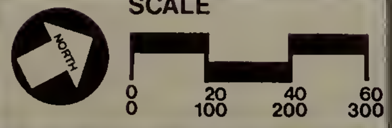


FIGURE
IV-88

FREDERIC R. HARRIS INC.

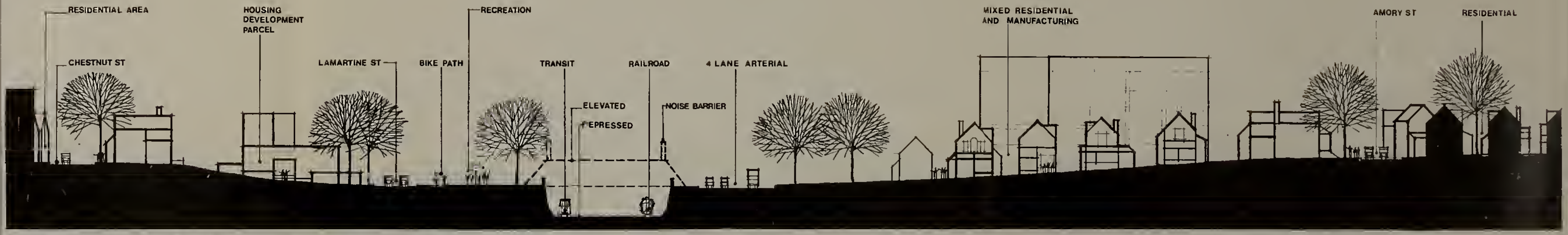
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

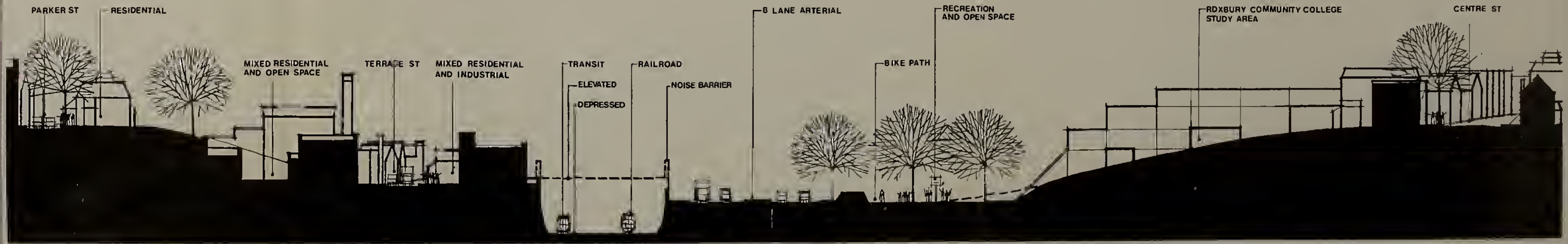
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

ILLUSTRATIVE SECTIONS

JAMAICA PLAIN
ROXBURY
TRACKS DEPRESSED
ARTERIAL EAST

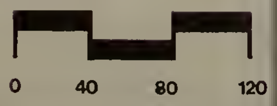


JAMAICA PLAIN AT ATHERTON STREET FH2



ROXBURY AT CEDAR STREET FH2

SCALE



FIGURE

IV-33A

FREDERIC R. HARRIS INC

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

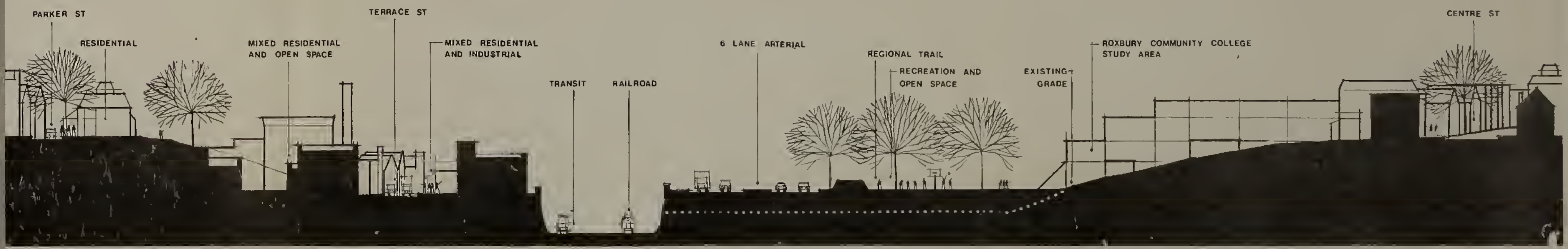
ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

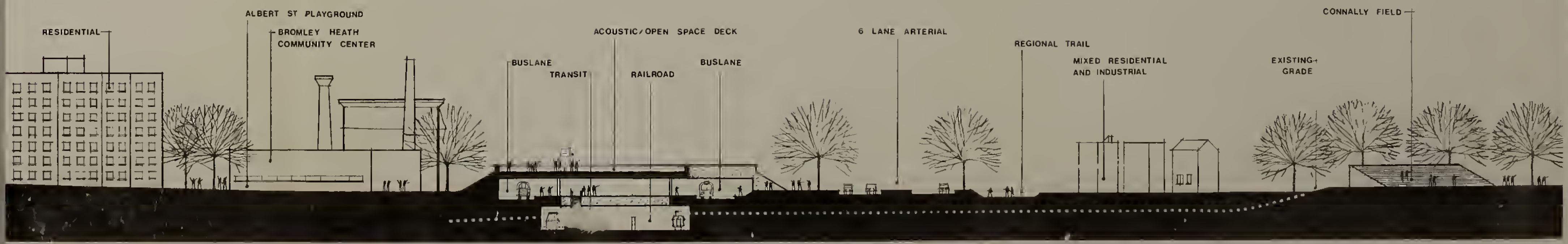
ILLUSTRATIVE SECTIONS

SOUTH END
ROXBURY
TRACKS MODIFIED DEPRESSED
ARTERIAL EAST

CARTER PLAYGROUND AT CAMDEN STREET FH5



ROXBURY AT CEDAR STREET FH5



ALBERT STREET PLAYGROUND AT JACKSON SQUARE FH5

SCALE

0 40 80 120

FIGURE

IV-55A

FREDERIC R. HARRIS INC

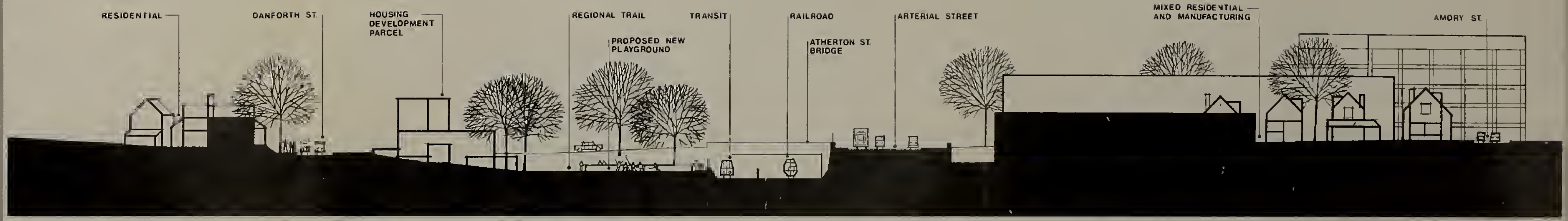
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

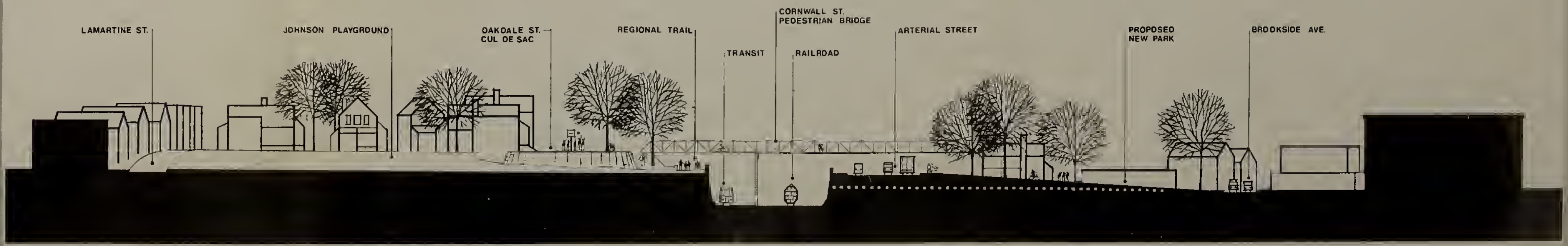
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

ILLUSTRATIVE SECTIONS

JAMAICA PLAIN
TRACKS MODIFIED DEPRESSED
ARTERIAL EAST



PROPOSED NEW PLAYGROUND AT BOYLSTON STATION FH5



JOHNSON PLAYGROUND AT GREEN STATION FH5

SCALE

0 40 80 120

FIGURE

IV-55B

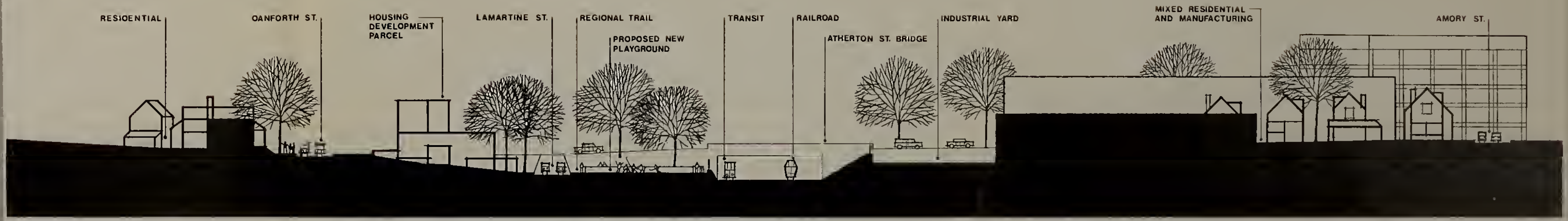
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

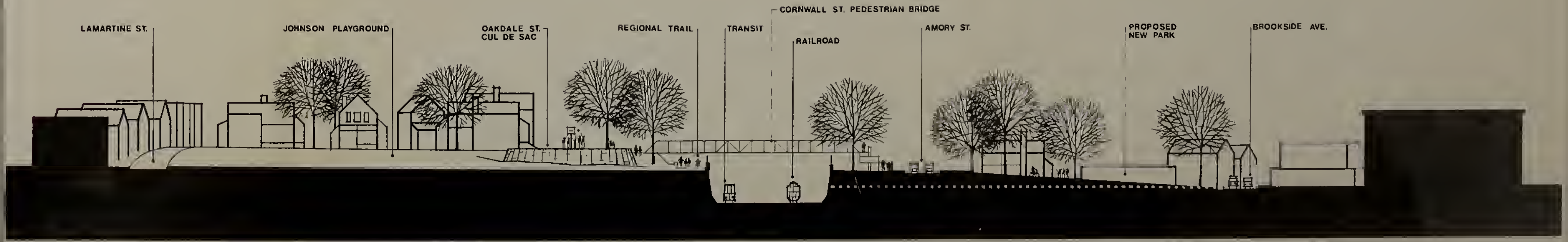
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

ILLUSTRATIVE SECTIONS

JAMAICA PLAIN
TRACKS MODIFIED DEPRESSED
NO ARTERIAL



PROPOSED NEW PLAYGROUND AT BOYLSTON STATION FH6



JOHNSON PLAYGROUND AT GREEN STATION FH6

SCALE

0 40 80 120

FIGURE IV-60A

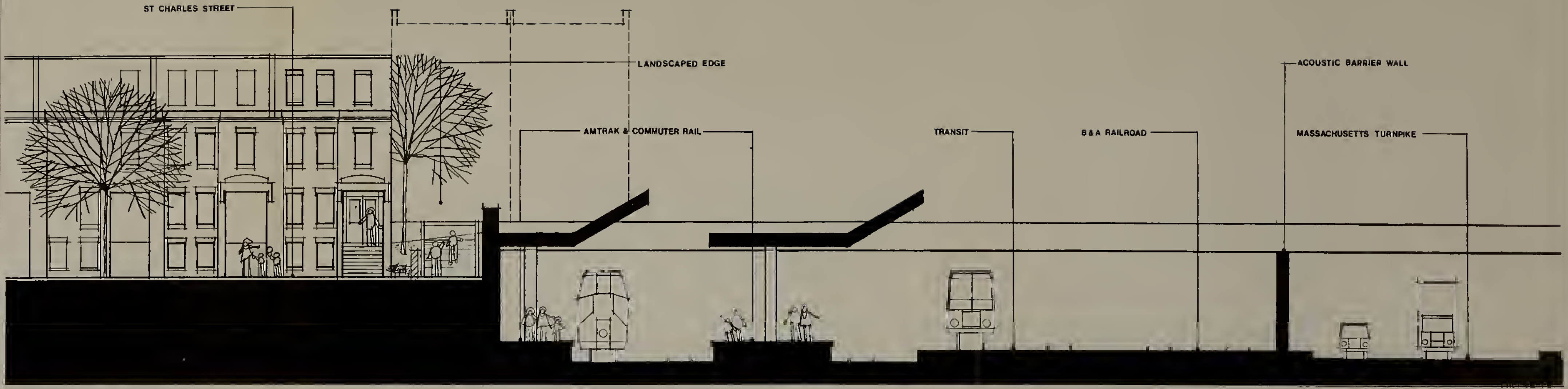
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

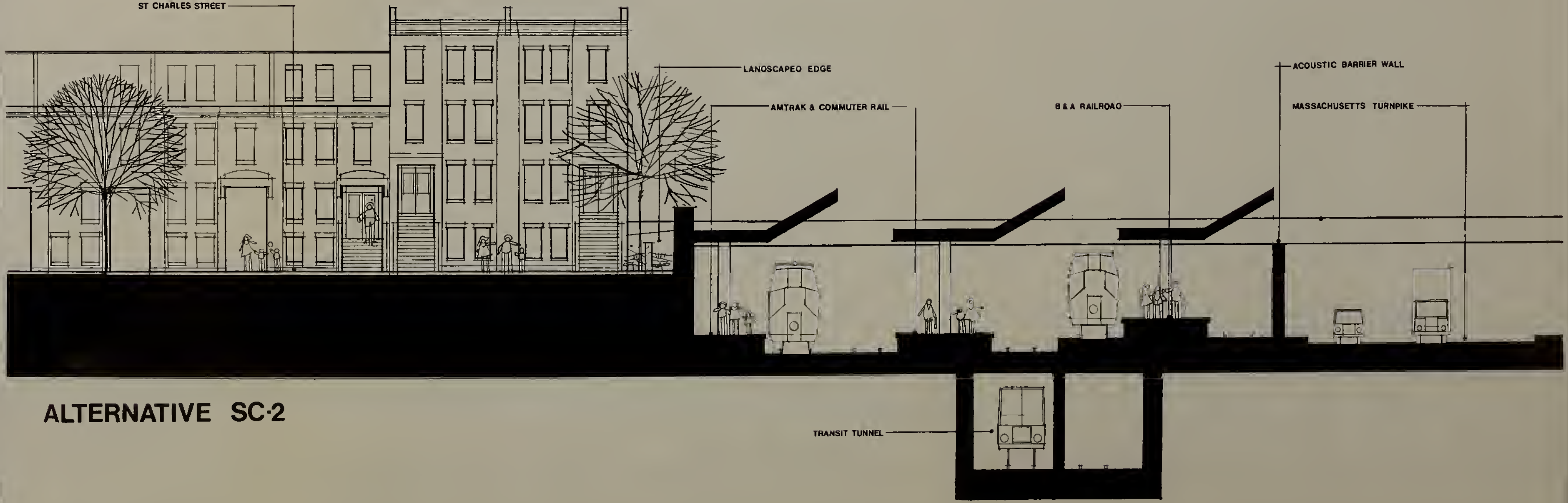
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

ILLUSTRATIVE SECTIONS

BACK BAY



ALTERNATIVE SC-1



ALTERNATIVE SC-2

SCALE

0 10 20 30

FIGURE IV-68A

FREDERIC R. HARRIS INC.

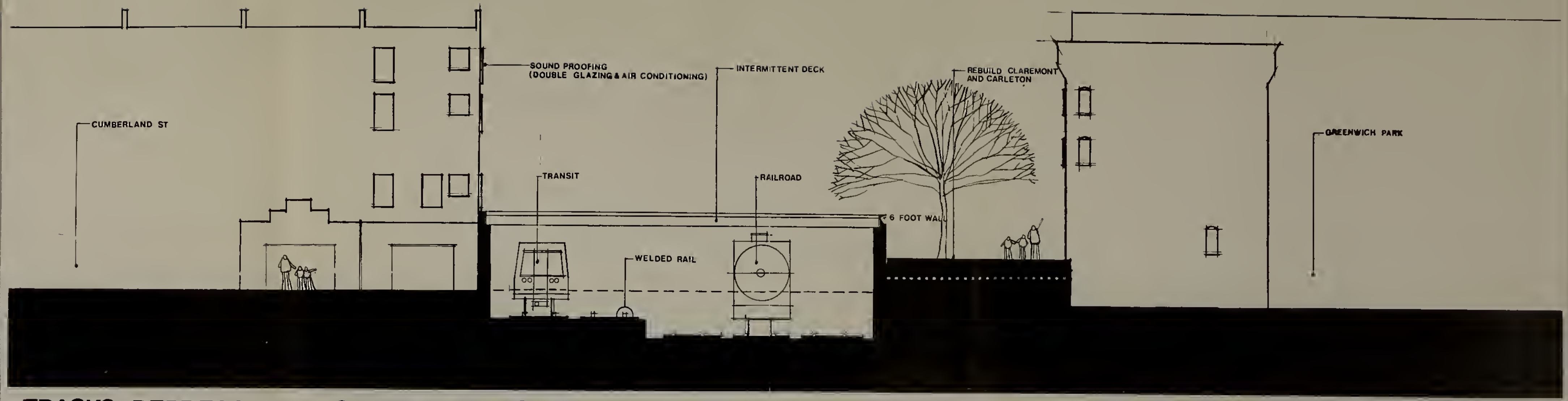
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

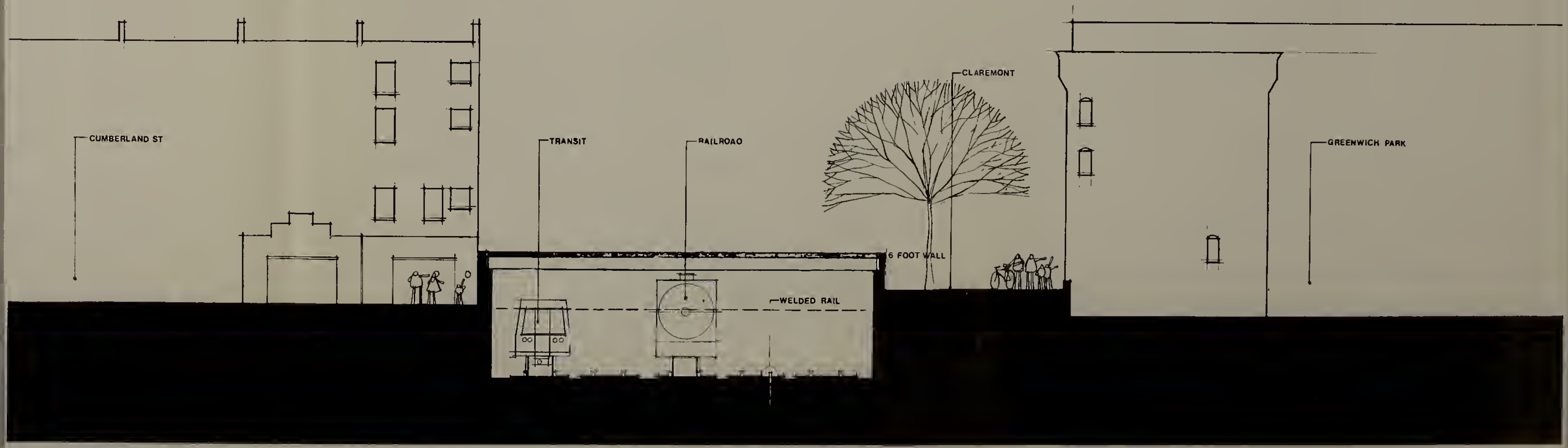
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

ILLUSTRATIVE SECTIONS

SOUTH END



TRACKS DEPRESSED 2 TO 5 FEET SC1



TRACKS DEPRESSED SC1

SCALE

0 10 20 30

FIGURE

IV-68B

FREDERIC R. HARRIS INC.

a

APPENDIX

Appendix A

IMPACT ON PUBLICLY-OWNED LAND AND HISTORIC SITES

SECTION 106 MEMORANDUM OF AGREEMENT AND SECTION 4(f) STATEMENT

Appendix A

IMPACT ON PUBLICLY-OWNED LAND AND HISTORIC SITES

SECTION 106 MEMORANDUM OF AGREEMENT AND SECTION 4(f) STATEMENT

In a regional context, the Southwest Corridor contains a variety of open spaces, public parklands, recreational areas and historic resources which serve the needs of a large urban population. Because of their important contribution to the quality of life in the total environment, careful attention has been given to the relationship between these resources and the transit alternatives. These environmental concerns are brought into focus by the legal requirements of the National Environmental Policy Act (NEPA) of 1969 and Section 4(f) of the Department of Transportation (DOT) Act of 1966, as amended and Section 106 of the Historic Preservation Act.

Section 102 of the NEPA requires the preparation of a detailed Environmental Impact Statement which includes a description of the environmental impact, unavoidable adverse effects, alternatives, and irreversible commitments of resources for "major Federal actions significantly affecting the quality of the human environment."

Section 4(f) of the DOT Transportation Act of 1966 is intended to result in a comprehensive evaluation of all environmental impacts involved in Federal-aid transportation projects that require the use of public parklands, recreation areas, wildlife and waterfowl refuges, and public or privately owned historic properties of Federal, State or local significance. This evaluation is referred to as a Section 4(f) report. The report must be sufficiently detailed to permit the U. S. Secretary of Transportation to determine that:

- There is no feasible and prudent alternative to the use of such land, including the no-build option.
- The program includes all possible planning to minimize harm to any park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use of such lands.
- If there is no feasible and prudent alternative, the proposed project must include all possible planning to minimize harm to the affected lands.

As a consequence of the legal constraints and framework, an initial inventory of all potential 4(f) lands or structures was performed. Our review shows that some of these properties are definitely 4(f) lands and for others, their 4(f) status is not clear. Sources of information included the BTPR Southwest Report; available Metropolitan District Commission and municipal documents such as open space/recreation plans; and contacts with park commissions, municipal planners, historic commissions, the State Historic Preservation Officer and other knowledgeable persons.

To further assist in the collection and analysis of data, letters requesting a determination of significance were sent to the agencies or people having jurisdiction over the potential 4(f) lands. These letters requested specific items of information to substantiate a declaration as well as the determination per se.

This initial inventory of actual or potential 4(f) lands was followed by an analysis of impacts resulting from the proposed project. Both long-term and short-term impacts were considered, as were the impacts of alternatives to the project.

Careful attention was given to historical 4(f) resources since the Southwest Corridor has an extraordinarily high proportion of sites, structures and districts that are historic or have architectural distinction. The term historic resources refers to sites, structures or districts of historic, architectural or archeological significance. There are several levels of official recognition granted to these resources. The U. S. Department of the Interior maintains a "National Register of Historic Places" which lists historically important national, state and local resources. A few are of particular national importance, and are selected for additional distinction by being named National Historic Landmarks.

A-1 Summary

The Southwest Corridor project is a rail/transit, arterial street facility extending from the Boston central business district to Forest Hills Station; a distance of approximately 4.5 miles (Fig. A-1).

Project alternatives require the use of property in one or more of the following areas: (1) the South End Historic District (Cazenove Street, St. Charles Street, Berkeley Street, Columbus Avenue, and Massachusetts Avenue); (2) the Historic Olmsted Park System (Stone Viaduct at Forest Hills); (3) several playgrounds (Albert Street, McDeavitt and Johnson); and various potentially eligible sites (elevated structure and station on Washington Street, and Old Police Station No. 10).

Since the South End Historic District and the Olmsted Park System appear on the National Register, Section 106 of the National Historic Act and Advisory Council procedures are considered for these properties. Consultation with the State Historic Preservation Officer and Boston Landmarks Commission indicates that although some of the takings represent an adverse effect, the measures which are proposed will minimize the harm from such action. (See letters, Fig. A-30, A-31 and A-32). A memorandum of agreement with the Advisory Council on Historic Preservation is shown at the end of this appendix and indicates the concurrence of the Boston Landmarks Commission and the SHPO with the proposed course of action.

Each 4(f) area is discussed, describing the existing lands, facilities, use and patronage. The probable construction impacts are described and mitigating measures are suggested which would provide for maintenance of recreational functions and protect the structure and character of historic resources during the construction. An archeologist will also be available in accordance with Massachusetts law throughout the construction process to make site investigations. Artifacts of potential archeological value will be identified so that actions could be taken for appropriate salvage operations under the direction of qualified professionals. All such activities would be coordinated with the Massachusetts Historical Commission.

The following sections demonstrate that there is no feasible and prudent alternative to the proposed action and that all necessary steps have been taken to minimize harm.

The project definition of the Orange Line Relocation and Arterial Street Construction has evolved from a complex of previous studies, policy decisions, cooperative agreements and community participation. At each step in this planning process, a different range of alternatives has been examined at an increasingly discriminating level of detail. The BTPR Southwest Corridor Report and Section 1.2.5 of this document contain a detailed history of alternative transit programs for the region. The selected alignment follows existing transportation rights-of-way to avoid the greatest numbers of properties, recreational facilities and historic resources; construction impacts have also been kept to a minimum by this alignment.

Within the context of the extensively developed manmade environment of the study corridor and the existing social, cultural and physical constraints, no prudent and feasible alternatives exist for avoiding all impacts to 4(f) properties. The details of the relationship between the specifics of the construction process and geometric design of the project and the affected 4(f) properties and the mitigating measures necessary to afford maximum protection to these important resources are described in the following sections.

There are certain impacts which cannot be fully anticipated nor mitigated until the final design process. To foster appropriate protective measures for these important resources, a process has been established in each case whereby cooperation between the MBTA and the local responsible agencies will achieve this objective.

A.2 Study Area Location

The general project area is in the portion of the City of Boston bounded by the MBTA Red Line Ashmont Branch on the east, the downtown area on the north, the Riverway Arborway parkland on the west, and Cummins Highway on the south. The project begins at the fringe of downtown Boston and extends along the existing right-of-way of the Penn Central Shore Line to the vicinity of the Forest Hills commercial area at Walk Hill Street (Fig. A-1).

A.3 Project Description

The MBTA's Orange Line runs north and south between Forest Hills and Malden Center. A northern extension to Oak Grove at the Malden-Melrose Line is under construction. The Orange Line is primarily located at grade or on an elevated structure except for the 1.0 miles of subway through downtown Boston under Washington Street, and a new tunnel under the Charles River from Haymarket Station to Community College Station. The elevated portion of the line is located above Washington Street, in the southwest portion of the City of Boston and generally parallels the proposed relocation section (Fig. A-2).

A.3.1 Transit/Rail Alternatives

The following transit and rail alternatives between South Cove and Forest Hills are among those which are the subject of this Environmental Impact Statement:

- No Build
- Railbed on Modified Embankment (Raised and Widened)
- Railbed Depressed
    - Full (maximum depth)
    - Modified (minimum depth)
    - Post-Hearing (intermediate depth) (the Proposed Project)

The following transit and rail facilities are the preferred alternative proposed to be constructed as a result of this analysis:

- Relocate approximately 4 .7 miles of the existing Orange Line from Back Bay Station and on to Forest Hills. The line will consist of two tracks and will generally follow the present railroad right-of-way. The southern terminal of this project will be a new station at Forest Hills.
- Replace existing four-track railroad with three new tracks parallel to and east of the transit tracks, from South Cove Tunnel portal to Forest Hills, diverging at Forest Hills to Providence (Shore Line) and to Needham (Needham Branch), allowing either railroad or transit on the Needham Branch in the future.
- Both the transit and railroad tracks and station platforms would be constructed in a new depressed section between a point just south of Massachusetts Avenue and a point south of Forest Hills.
- Provide for the possibility of future rapid transit or railroad tracks on both the Needham Branch and Shore Line (main line) beyond Forest Hills.
- Remove existing Washington Street elevated structure between South Portal and Forest Hills and provide interim Replacement Service between Downtown Boston and Dudley Station until a permanent Replacement Service has been provided.

A.3.2 Arterial Street Alternatives

Current arterial travel in the corridor is an arduous task. The existing arterial route from Forest Hills to the core area is negotiated via a connection of streets, each of which is incapable of providing acceptable service.

Two routes are involved which are characterized by truck loadings, local traffic congestion and parking problems. These conditions cause inconveniences to both drivers and pedestrians. The shorter route alternative is Lamartine Street or Amory Street to Jackson Square; Columbus Avenue to Roxbury Crossing; Columbus Avenue or Tremont Street to Massachusetts Avenue. A more circuitous route is Washington Street to Egleston Square, then Columbus Avenue to Roxbury Crossing.

Both routes are discontinuous, have complex intersections and are deficient in carrying capacity.

Lamartine and Amory Streets, designed as residential streets, are deficient as arterials, but function as such today.

The alignment of Columbus Avenue at Roxbury Crossing is extremely poor. In addition, both Columbus Avenue and Tremont Streets have poor surface drainage and deteriorated roadbed and pavement.

The Washington Street elevated transit structure presents the motorist with visual, physical and psychological problems. Piers located between lanes and at odd places introduce obvious restrictions. Additionally, Washington Street, basically a commercial street, serves poorly as an arterial with through motorists, shoppers, and delivery personnel in competition for the same limited space.

The proposed arterial street component of the project starts from Columbus Avenue at the intersection of Ruggles Street and follows in a southerly direction the Penn Central Railroad, paralleling it to tis termination at Jackson Square or Forest Hills. The total maximum length is about 2.7 miles.

The arterial street was divided into three segments as follows: (Fig. A-3)

<u>Segment #1</u> - Massachusetts Avenue to Ruggles Street

<u>Segment #2</u> - Ruggles Street to Jackson Square

<u>Segment #3</u> - Jackson Square to Forest Hills

It has been determined by Massachusetts DPW, with the concurrence of FHWA, that Segment #1 is a non-major action project. As such, the National Environmental Policy Act of 1969 (NEPA) does not apply. Consequently, the arterial from Massachusetts Avenue to Ruggles Street (Segment #1) has not been included in this impact statement.

The build alternatives under consideration for Sections #2 and #3 are as follows:

- Build Segment #2 only
- Build Segments #2 and #3

A.4 Summary Description of Project Alternatives

In addition to a No Build Alternative, eight Build Alternatives are under consideration. (See Fig. A-4)

All Build Alternatives start at the South Cove Tunnel Extension, extend approximately 0.5 miles in a westerly direction to Back Bay Station, then follow the Penn Central Railroad corridor in a southwesterly direction 4 miles to Forest Hills Station.

A.4.1 South Cove to Camden Street

There is no arterial street in this segment.

Two relocated Orange Line options are considered for this section. One option has the tracks essentially just above water table elevation but lowered somewhat from existing grade and treated with measures to attenuate noise levels (Option SC-1), while the second option continues a tunnel to Dartmouth Street with the railroad at existing grade above (Option SC-2). Both options SC-1 and SC-2 propose noise attentuation measures between Dartmouth Street and Massachusetts Avenue, including welded steel rail, continuous-wall noise barriers paralleling the rail/transit right-of-way, and an intermittant acoustic deck over the right-of-way.

A.4.2 Camden Street to Forest Hills

Alternatives for this section are as follows:

FH-1 Rail/Transit Depressed below adjacent ground, no Arterial Street constructed.

FH-2 Rail/Transit Depressed as above. Arterial Street constructed east of rail facility between Ruggles Street and Jackson Square. Arterial Street constructed or not constructed beyond Jackson Square.

FH-3 Rail/Transit on Modified Embankment, no Arterial Street constructed.

FH-4 Rail/Transit on Modified Embankment, Arterial Street constructed to the east of Rail/Transit from Ruggles Street to Jackson Square, crossing to the west of the tracks at this point and continuing or not continuing to Forest Hills.

FH-5 Rail/Transit Modified Depressed. Arterial Street constructed east of rail facility from Ruggles Street to Forest Hills.

FH-6 Rail/Transit Modified Depressed. Arterial Street constructed east of rail facility between Ruggles Street and Jackson Square, no Arterial Street constructed beyond Jackson Square.

A.4.3 Post-Hearing Profiles

On the basis of responses to the Public Hearing held on July 15, 1976 changes were made on the vertical profile of the Modified Depressed alternatives. The new alternatives are as follows:

PHP-1 Rail/Transit Depressed in Post-Hearing Profile. Arterial Street constructed east of rail facility from Ruggles Street to Jackson Square, no Arterial Street constructed beyond Jackson Square. The rail/transit alignment is the same as alternatives SC-1 and FH-6.

PHP-2 Rail/Transit Depressed in Post-Hearing Profile. Arterial Street constructed east of rail facility from Ruggles Street to Forest Hills. The rail/transit alignment is the same as alternatives SC-1 and FH-5.

Combinations of Alternatives are shown in Figure A-4.

A.4.4 Forest Hills Station

The station would be elevated for the embankment alternative or semi-depressed for the depressed alternatives.

A.5 Section 4(f) and Section 106 Properties

A.5.1 Identification of Properties

In consultation with the Massachusetts Historical Commission, the Boston Landmarks Commission, the South End Historical Commission, the Back Bay Architectural Commission, Boston Housing Authority and Metropolitan District Commission, a survey was made to identify Section 4(f) and 106 properties in the vicinity of the proposed transportation project, including publicly-owned parkland; property already on the National Register of Historic Places, and those that appear to be potentially eligible for nomination to the National Register.

The following properties and sites have been identified (their location is shown in Figure A-5):

<u>Publicly-Owned Park Land</u>

Albert Street Playground

McDeavitt Playground

Johnson Playground

Sparrow Park

Everybody's Park and Basketball Court

William E. Carter Playground

Playgrounds located along the Washington Street elevated structure

<u>Property Listed in the National Register of Historic Places</u>

Back Bay Historic District

South End Historic District

Eliot Burying Ground

Loring-Greenough House

Franklin Park

Arnold Arboretum

Olmsted Park at Forest Hills

Youth's Companion Building

<u>Property Potentially Eligible for Nomination to the National Register</u>

St. Botolph Street Area

Monument Square Area

Dudley and Hampton Streets Area

Winthrop-Waverly-Warren Streets Area

Roxbury Highlands Area

Mission Hill Church

Dudley Mansion

Chestnut and Lamartine Streets Area

Amory Street Workers' Houses

Seaverns Avenue Workers' Houses

Forest Hills Cemetery

Salvation Army Building

Cahner's Building

Jamaica Plain Neighborhood House

Elevated Structure and Stations on Washington Street

Old Police Station No. 10

Bay Village Area

Several interested groups have initiated [illegible] procedures for both the St. Botolph Street and Monument Square Areas. A determination of the effect the proposed project will have on all the potentially eligible properties listed above was made, although final evaluation by the State Historic Preservation Officer may result in none of these sites being placed in the National Register of Historic Places. The comments made herein should not be construed as endorsement by the MBTA for nomination of any of these properties to the National Register.

A.5.2 Determination of Effect

In accordance with the procedures established by the Advisory Council on Historic Preservation and in consultation with the Massachusetts State Historic Preservation Officer and cognizant state agencies, a determination was made of which of the properties listed above would be either not affected, not adversely affected or adversely affected by the proposed project. Steps which will be taken to minimize harm to those sites or properties adversely affected were also defined. The following sections show a description of the properties in question and evaluation of the expected impact and details of proposed measures to minimize harm.

A.5.3 Property Not Affected by the Project

The proposed rail/transit, arterial street facility and associated removal of the elevated will have no effect on the following properties or sites.

A.5.3.1 Back Bay Historic District

A.5.3.1.1 Description

Taken as a whole, the Back Bay attains great historical importance in three areas:

1. as an example of ambitious and progressive city planning in the nineteenth century;
2. as a superb retrospective view of American architecture in the last half of the nineteenth century;
3. as a tangible reflection of the age when Boston was the cultural fountainhead of America.

The Back Bay Historic District is presently a densely built-up area of fashionable apartments, office and business facilities, schools and other institutions. Most of its original structures survive, and despite many variations in architectural style, they are distinguished by a general consistency of character, form and scale. Enclosed within well-defined bounds, the Back Bay comprises, in effect, an easily discernable enclave of superior nineteenth century architecture in the city proper.

The streets of the Back Bay are arranged in a regular grid of rectangular blocks oriented longitudinally along five main axis avenues and intersected at equal intervals by less important transverse streets. The core of this system is Commonwealth Avenue. Laid out as a grand boulevard along the central axis of the grid, it includes a wide, elm-shaded, pedestrian mall within its 240 foot width and 1 1/8 mile length from the Public Garden to Charlesgate East. The other principle axis streets are Beacon, Marlborough, Newbury and Boylston. The cross streets, named for English nobility and occuring in successive alphabetical order are: Arlington, Berkeley, Clarendon, Dartmouth, Exeter, Fairfield, Gloucester, Hereford, followed by Massachusetts Avenue and Charlesgate East.

The area incorporates the Public Library (McKim, Meade and White, 1887), Trinity Church (H.H. Richardson, 1877), Old South Church (Cummings and Sears, 1875), and the Copley Plaza Hotel (Henry Hardenburgh, 1912) which define Copley Square and characterize its public importance. Across the district from Copley Square, the Storrow Embankment was created as a park in 1931 along the southern bank of the Charles River Basin. It contains, in addition to an automobile parkway, a small man-made lagoon and the Hatch Memorial Shell, where free concerts and entertainments are given during summer months.

The buildings in the district comprise a vast number of styles executed in the sixty formative years of architectural development in the Back Bay. Represented are the Italianate, French Academic, Gothic, Ruskinian Gothic, Panel Brick, Queen Anne, Richardsonian Romanesque styles - and the later Revivals, the Italian Renaissance, German Renaissance, Beaux Arts, Chateauesque, Georgian, Federal, and Adamesque. While pure examples of every style exist, variations combining elements from two or more styles are common.

A.5.3.9.2 Effect

Because of its location relative to the proposed project, the Back Bay Historic District will not be affected. Nevertheless, the Back Bay Historical Commission will be consulted in the design of the proposed Back Bay Station (though this station is not within the Historic District, it is located in close proximity to it).

A.5.3.2 Loring-Greenough House

A.5.3.2.1 Description

The Loring-Greenough House, built in 1769 for Joshua Loring, has been certified as a Massachusetts Historic Landmark because of its historical connections with the American Revolution and its value as an example of Colonial architecture. The mansion, with its adjoining carriage house and gardens, is the last of the numerous country estates of its period remaining in Jamaica Plain.

A.5.3.2.2 Effect

Because of its location relative to the proposed project, the Loring-Greenough House will not be affected.

A.5.3.3 Monument Square Area

A.5.3.3.1 Description

The Monument Square area is bounded by Eliot Street, South Street, Centre Street, Holbrook Street and Dane Street. The Square and the buildings surrounding it form a significant entity which embodies a distinctive type of late 18th Century and 19th Century village development. One house in the area, the Loring-Greenough House, is on the N.R.H.P. and the Olmsted Park System borders on the west. The area contains plentiful examples of notable 19th Century houses including Gothic Revival, Italianate and Mansard houses; the neighborhood also has many Queen Anne, Shingle and Colonial Revival homes.

A.5.3.3.2 Effect

It is anticipated that none of the alternatives for the proposed project will have any effect on the area, although it is conceivable that some traffic may be diverted from the Jamaicaway to the Arterial Street, thus lowering the noise level on the western borders of the Monument Square area.

A.5.3.4 Dudley and Hampton Street Area

A.5.3.4.1 Description

There are four public buildings located at the intersection of Dudley and Hampton Streets, namely: Firehouse, Church and Convent, School, and Police Station. The cohesiveness of these Victorian public buildings as well as their architectural quality may result in their being nominated to the N.R.H.P.

A.5.3.4.2 Effect

None of the proposed alternatives will have any effect on this area.

A.5.3.5 Winthrop-Waverly-Warren Streets Area

A.5.3.5.1 Description

This area is bounded by Winthrop Street, Blue Hill Avenue, Waverly Street and Warren Street. The neighborhood contains a relatively large number of samples of Italianate architecture including an Italian villa, and several Gothic Revival houses.

A.5.3.5.2 Effect

None of the proposed alternatives will have any effect on this area.

A.5.3.6 Roxbury Highlands Area

A.5.3.6.1 Description

This area is bounded by Centre Street, Marcella Street, Washington Street and New Dudley Street. The area reflects the heritage of three settlements: White Protestants (1700-1915), Jews (1900-1950), and Afro-Americans (1930-present). The creation of Franklin Park in 1885 accelerated the construction of homes. Styles include: Queen Anne, Georgian Revival, Colonial, Federal, Greek Revival, Second Empire, Shingle Sytle and Gothic cottages.

A.5.3.6.2 Effect

None of the alternatives will affect the Roxbury Highlands area. In alternatives FH-2, FH-4, FH-5 and PHP-2 increased traffic in the proposed arterial street will increase the noise level in the area but it is anticipated that the change will not be significant. Considerable development in the vacant land originally cleared for the defunct I-95 project (i.e., Roxbury Community College) and proposed open space development will enhance utilization of the area by residents of Roxbury Highlands. Removal of the Washington Street elevated structure will have a beneficial effect on this area.

A.5.3.7 Mission Church

A.5.3.7.1 Description

The Mission Church, also known as the Basilica of Our Lady of Perpetual Help, is of romanesque-design and is located at 1545 Tremont Street, between Roxbury Crossing and Brigham Circle. It was designed in 1876 by William Schickel and Franz Untersee.

A.5.3.7.2 Effect

None of the proposed alternatives will have any effect on this property.

A.5.3.8 Chestnut and Lamartine Streets Area

A.5.3.8.1 Description

This area is bordered by Chestnut and Lamartine Streets between Paul Gore Street and Green Street. It encompasses a number of 19th Century houses, mostly Greek Revival and Mansard Style homes.

A.5.3.8.2 Effect

None of the alternatives will affect the Chestnut and Lamartine Streets area. Alternatives FH-2, FH-4, FH-5 and PHP-2 will result in some of the through traffic which presently uses Lamartine Street to be diverted to the arterial street, therefore improving both the congestion and noise levels in the area. In all the alternatives, use of the deck and adjacent vacant land as part of the development of open space will enhance the visual and physical continuity between the area and other sections of the city presently obstructed by the presence of the embankment.

A.5.3.9 Amory Street Workers' Houses and Jamaica Plain Neighborhood House

A.5.3.9.1 Description

A row of single and two-family mansard roof houses located on both sides of the 200 block on Amory Street represents a unique historical episode in the history of Boston (see Fig. A-5d). These houses were constructed in the late 1800's and housed workers employed in the various breweries and factories located in the area. The Jamaica Plain Neighborhood House once housed a German Art Center (see Fig. A-5dd).

A.5.3.9.2 Effect

The proposed alternatives PHP-1 and PHP-2 will not significantly affect the area. In alternative PHP-2 traffic in the arterial street will increase the noise level in the area; however, depression of the rail/transit facility will reduce the noise level from the present levels. Therefore, it is anticipated that the resulting noise level will not significantly differ from that presently experienced. In alternative PHP-1, without the arterial street, the noise level will be significantly lower than the one presently experienced.

A.5.3.10 Seaverns Avenue Workers' Houses

A.5.3.10.1 Description

The houses located at 84-92 Seaverns Street are similar to the Amory Street workers' houses (see Fig. A-5e).

A.5.3.10.2 Effect

None of the alternatives will affect the Seaverns Avenue Workers' Houses. These houses are not in close proximity to the project. It is anticipated that location of the proposed Green Street Station may result in a slight increase in street traffic but not to any significant degree.

A.5.3.11 Forest Hills Cemetery

A.5.3.11.1 Description

The rural cemetery movement in the United States began in Boston in the mid 1820's. By this time the small city burial grounds and churchyards of the 17th and 18th centuries had become both inadequate and unsanitary. Mt. Auburn Cemetery was consecrated in September of 1831. In the fifteen years of so after its opening several other cemeteries, among them Laurel Hill in Philadelphia and Greenwood in Brooklyn, were established in various parts of the country. All of these, however, were private cemeteries. Forest Hills was the first rural cemetery to be established by a municipality, and a portion of it was set aside for free public burial. Although most of the lots were of an ample size, another section of Forest Hills (the Field of Machpelah) was reserved for smaller lots which could be purchased at less expense. Preliminary work on the main avenues was done in time for consecration, which took place on June 28, 1848.

The principle of design of Forest Hills included curving avenues which conformed closely to the natural contours of the land. The planting and the winding avenues and paths enhanced the natural beauty of the site, creating vistas which focussed on Lake Hibiscus, the three-acre artificial body of water in the cemetery, and on the distant Blue Hills of Milton and Canton. The elaborate circulation system was a masterpeice of functionalism, which made it possible to approach any grave without going over others.

Shortly after the consecration of Forest Hills, the remains of many eminent persons who had died long before were moved to its grounds. These included John Eliot, pastor of the First Church in Roxbury, who died in 1690, and General Joseph Warren, who was killed at the Battle of Bunker Hill. In 1851, the designer of Forest Hills Cemetery, Roxbury Mayor Dearborn, died and was buried at Forest Hills in a spot which he had selected. Additional parcels of land were purchased in the second half of the 19th century, increasing the area to its present 260 acres. Roxbury was annexed to Boston in 1868 and since that time Forest Hills Cemetery has been a private corporation.

A.5.3.11.2 Effect

None of the alternatives will have an effect on the Forest Hills Cemetery.

A.5.3.12 Additional Properties Not Affected

One historic site (the Youth's Campanion Building at 209 Columbus Avenue, Figure A-5t); two potentially eligible sites (the Cahners Building at 221 Columbus Avenue, Figure A-5s, and the Salvation Army Building at 147 Berkeley Street, Figure A-5t); and the Back Bay Village Area will not be affected by the project. They are located north and west adjacent to the Massachusetts Turnpike, which separates them from the proposed project alignment. The William E. Carter Playground (Figure A-5u) is separated from the proposed project by vacant land.

A.5.4 Property Not Adversely Affected by the Project

The proposed rail/transit, arterial street facility and associated removal of the elevated will have no adverse effect on the following properties or sites.

A.5.4.1 The Albert Street Playground

The Albert Street Playground (Fig. A-5, A-6, A-7) would not be adversely affected by Alternatives FH-3, FH-4, FH-5, FH-6, PHP-1 and PHP-2.

Alternative PHP-1 has been selected as the Preferred Alternative for construction. The MBTA commits itself to the accomplishment of all measures to mitigate harm raised herein as part of the Project.

The design and operation of parks that would be affected will be carefully coordinated with their operating agencies. Contact has already been initiated with the Boston Housing Authority and the Metropolitan District Commission in that regard.

A.5.4.1.1 Description

The Albert Street Playground is a hard surfaced play area located within the Bromley Heath Housing Project. This one acre facility, which fronts on Lamartine Street and the exisiing railroad embankment, is one of the principal outdoor recreation places nearby this densely populated housing. The significance of the playground, which is essentially a bare asphalt surface with very little play equipment, lies in the fact that it must serve so many. Hence, any opportunity to increase the area of the playground would be of benefit to the neighborhood, and any significant decrease in its area would be adverse in impact.

A.5.4.1.2 Impacts

In the Alternative FH-4 the modification of the present rail embankment and construction of the Arterial Street, it would be necessary to shift the right-of-way westward to accomodate the transit station platform. This will require relocating Lamartine Street westward and taking approximately 10 feet in depth along the 340-foot length of the playground to attain adequate street width. This would remove 3,400 square feet of the playground. Since the playground level is several feet above the existing street, a new retaining wall would have to be constructed. The treatment of the new wall might be coupled with other amenities including lighting, planting, new playground equipment, access stairs from the street, and other measures to offset the land taking. Since the taking does not require moving play equipment or reducing any formal game areas, the effect of the taking is minimal, although a perceived decrease in size could be adverse.

Noise levels in the playground are axpected to increase in the embanked alternatives (FH-3 and FH-4) though noise barriers, if constructed paralleling and on top of the embankment, would deflect most sound away from the play area. These barriers and the increase in embankment height would impinge upon sight lines from the playground and diminish its apparent size.

Alternatives FH-1, FH-2, FH-3 and FH-4 and PHP-1 and PHP-2 substantially increase the area of the playground by decking over the depressed rail/transit facility and improving the useability of the space. Rail/transit noise is virtually eliminated in these alternatives.

Alternatives PHP-1 and PHP-2 would permit the elevation of the playground to be raised approximately 5 feet above its existing grade. This filling would raise it from its "pit like" configuration currently surrounded in three sides by concrete retaining walls. The playground would be completely rebuilt with tot-lot areas and sitting areas in proximity to the existing houses in the Bromley Heath Development, and with adolescent active play areas on the proposed deck over the rail/transit facility. Proposed alternatives could be accomplished and leave the playground at its current elevation, though it would not be improved in that case. The vertical profiles of the proposed alternatives PHP-1 and PHP-2 are approximately 5 feet lower than those of alternatives FH-6 and FH-5 respectively, allowing for an uninterrupted terrain profile. As indicated in Fig. A-8, the Boston Housing Authority, owner of the Albert Street Playground, concurs with the MBTA's evaluation that the proposed alternatives represent a minimal effect on this property.

A.5.4.1.3 Alternatives to the Proposed Actions

In the "no-build" alternatives, the Albert Street Playground would remain in its current size and configuration, though increased service on the railroad would yield increased noise levels.

Other alternatives include a complete relocation of the playground to an area west of the Bromley Heath Development, but this would remove the facility some distance from those who currently use it; this possible addition of new space should be seen only as a supplement to the proposed actions and not a substitute.

A.5.4.2 McDeavitt Playground

The land of the former McDeavitt Playground (Fig. A-5, A-6) is not adversely affected by any of the project alternatives.

A.5.4.2.1 Description

The McDeavitt Playground consists of an M.D.C. owned, hard surfaced, empty lot, approximately 100' x 150', located between the current railroad embankment and Lamartine Street. It is littered and illegally used as an off-street parking lot. It has not been used for playground pruposed for at least six years; prior to this time it contained swing sets and see-saws.

A.5.4.2.2 Impacts

The entire area of the former playground would be used for transit station construction. In the proposed alternative several new open spaces and playground areas would be provided in both the area immediately to the north and across Boylston Street to the south. These areas are considered more appropriate for playground use because they are larger, contain landscaping, are located away from the traffic at the proposed station area, and are already actively in use as playground spaces.

A portion of the present McDeavitt playground will be redeveloped as part of the corridor-wide bicycle and pedestrian path system. These insure a larger, more diverse and accessible park facility (see Fig. A-16). As indicated in Fig. A-9, the Metropolitan District Commission, owner of the McDeavitt Playground, concurs with the MBTA's evaluation that the proposed action would enhance usage of this property.

A.5.4.2.3 Alternatives to the Proposed Actions

Alternative Station locations would remove active, though undedicated, existing playground areas in order to preserve the unused, small, hard-type McDeavitt Playground. An easterly shift in railroad alignment is possible but this would adversely impact properties to the east of the rail alignment, including the Boylston Congregational Church.

A.5.4.3 The Johnson Playground

The Johnson Playground (Fig. A-5, A,10, A-11, A-16) is affected, but not adversely, by Alternatives FH-2, FH-4, FH-5, FH-6, PHP-1 and PHP-2.

A.5.4.3.1 Description

The Johnson Playground is a neighborhood park of approximatley 2.25 acres located between Lamartine and Oakdale Streets at Green Street in Jamaica Plain. The topography is such that the northeast corner (approximately 1/3 of the total park area) is on a level 12 to 15 feet above the rest of the park. The baseball diamond is located on this higher level. Additional facilities in the park include a small sheltered pavilion with toilets and equipment storage, a wading pool and a basketball court enclosed by a chain link fence (see Fig. A-10, A-11).

A.5.4.3.2 Impacts

The playground is affected in Atlernatives FH-2, FH-4, FH-6, PHP-1 and PHP-2. These alternatives would eliminate Oakdale Street as an intersection at Green Street. Oakdale Street is proposed as a cul-de-sac which allows continued access to the residential properties Oakdale currently serves. The option to close Oakdale in all alternatives eliminates through traffic from the Oakdale Street neighborhood (as shown in Alternatives HH-6 and PHP-1).

The cul-de-sac requires taking 0.16 acres from the playground. This would be offset entirely by annexing the right-of-way of that portion of Oakdale which is being closed to the Johnson Playground. This has an area

of approximately 0.17 acres. In addition, this modest exchange would be further mitigated by annexing the 13 or 23 acres of land east of Oakdale which is currently in DPW ownership. The area required for the cul-de-sac does not require any of the park's active play space, e.g., the baseball field or the basketball court. The coordinated development of the annexed park area and the proposed corridor-wide bicycle and pedestrian path system potentially represents a larger, more diverse and accessible park facility.

In proposed Alternatives PHP-1 and PHP-2 some filling of the lowest areas of the playground at Green Street is proposed. This area is not now actively used and consists of a fenced, grass planted strip approximately 25 feet wide by 25 feet long. The filling of this area from 0 to 3 feet would raise it closer to the next highest level of the existing playground and permit activities to be expanded on this level. In addition, it would permit access directly from Green Street at a more constant level than is possible today. As indicated in Fig. A-12 , the Metropolitan District Commission concurs with the MBTA's evaluation that the preferred alternatives do not appear to adversely affect the playground.

A.5.4.3.3 Alternatives to the Proposed Action

The full "no-build" option would leave the Johnson Playground as it is. It would, therefore, not connect to the proposed continuous open-space "greenbelt" because of the interference of Oakdale Street.

In alternatives FH-5, FH-6, PHP-1 and PHP-2 the portion of the playground proposed for filling could remain as is and simply continue to be on a lower level from the active play level of the park. It would, however, also be below the level of Green Street by a maximum of 5 feet, and therefore, continue to be unutilized, and would serve as a landscaped area only.

A.5.4.4 South End Historic District

Both options SC-1 and SC-2, described above, would affect the historic South End. Option SC-1 is contained in alternatives PHP-1 and PHP-2.

A.5.4.4.1 Description

The National Register of Historic Places Inventory Nomination Form describes the South End as a large, but well-defined, densely built-up area characterized by architecture of relatively few building types. It presents a unified environment distinguished by subtle variations in architectural style, detailing, building height and street width and direction. Its location is shown in Fig. A-5.

There are two predominant residential building types. The more numerous of these two building types is the double-basement bow-fronted brick rowhouse with mansard roof. The second predominant building type is a low basement, flat fronted rowhouse faced with brick, often adorned by a projecting oriel (bay window).

The principal streets passing through the South End, such as Harrison, Shawmut, and Tremont run roughly parallel to each other and to Washington Street. Most of the minor streets were laid out perpendicularly in a grid pattern in relation to these broad avenues. However, Columbus Avenue and the other later streets introduce new diagonals in an attempt to mesh the South End pattern with that of the later Back Bay.

A.5.4.4.2 Impacts

Impacts to the South End District vary with the Back Bay options. The existing Back Bay Station which opened circa 1900 has declined from a lively and prominent station during the "heyday" of rail travel, to an under-utilized facility today. The relocation of the Orange Line and the continuation of commuter and long-distance passenger service will require a station and platforms at Back Bay capable of accomodating modern rail operations.

The proposed number of tracks, electrification of the railroad, and the use of high platforms to provide easy access for handicapped persons indicate that the existing column placement is so incompatible that Back Bay Station will have to be replaced. The existing station (see Fig. A-13) will be replaced with a structure whose design is compatible with the nearby South End and Back Bay historic districts.

While the new station is not within either district, its design will be coordinated with local historical societies who will advise the constructing agency. Demolition of any of the structures and necessary redesign of streets will be done in consultation with the Massachusetts State Historic Preservation Officer.

A.5.4.4.2.1 Option SC-1

In this option all tracks, Boston and Albany, Orange Line and AMTRAK are proposed at a level from 2 to 5 feet below existing grade, but above the existing water table. Federal rail requirements for track radii and maximum permissible curvatures for barrier free high platforms results in the need for widening the existing track right-of-way. Option SC-1 would require 10 full takings and one partial taking. The foundation of one building would need to be protected by underpinning. (see Fig. A-13a).

A.5.4.4.2.2 Option SC-2

In Alternative Option SC-2 the transit tracks would be placed in a tunnel below the railroad level. Placing the transit underneath rather than adjacent to the rail tracks considerably reduced the lateral width required for track and platform R.O.W. Consequently, this option requires the taking of four (258-264 Columbus Avenue and 389-390 Massachusetts Avenue) structures within the South End District. It also includes noise control measures between Dartmouth Street and Massachusetts Avenue as in Option SC-1.

While this option would reduce the number of full property takings from 10 to 4 in the South End, it would not eliminate the dominant noise from the Massachusetts Turnpike. It would increase project cost approximately 20 million dollars. The six structures saved would be: The Garnet Lounge (262 Columbus Avenue); 18-28 Cazenove Street; and the Widdicomb/Stuart building (90-92 Berkeley Street).

Takings Which Do Not Constitute an Adverse Effect in the South End:

Morgan Memorial Building, 96 Berkeley Street (Fig. A-13d)

The Morgan Memorial Building on Berkeley Street would be impacted to the extent that the metal shed attached to it would be taken. This shed is badly rusted, in disrepair and unsightly.

285 Columbus Avenue (Fig. A-13d)

This property is not within the Historic District. It would not be taken. However, the right-of-way line would pass close to the Heath Building on Columbus Avenue so that the building would require underpinning.

90 and 92 Berkeley Street (Fig. A-13b)

The building occupied by the John Widdicomb and John Stuart Co. is a three-story reinforced concrete frame warehouse structure. The Berkeley Street facade is a brick masonry above the first floor. The first floor has been modified with an aluminum "store front". The entire building is painted with a combination of the colors grey, white and ochre. The building is inconsistent in construction type and use with the 2 and 4 story slab front apartment flats which abut on the east. Its loading facilities on St. Charles Street has a negative impact. Removal of the structure could represent a strengthening of the visual quality and historic continuity of this section of Berkeley Street if it is replaced with appropriate grading, landscaping and fencing. As elsewhere, its design should be carefully coordinated with local residents and the local historical society.

262 Columbus Avenue (Fig. A-13c)

The Garnett Lounge is a one-story yellow brick commercial structure totally a typical of South End building types and lacking any visible historic reference. Removal of this structure could clearly strengthen the historic qualities of the area.

Sparrow Park, Everybody's Park and Basketball Court (Figs. A-13ee and A-13eee)

Sparrow Park (located on West Newton Street), Everybody's Park (located between Harcourt and Holyoke Streets) and the Basketball Court (located on Holyoke Street) are adjacent to the proposed project and separated from it by vacant land which will be landscaped and incorporated into each park upon completion of the project.

A.5.4.5 St. Botolph Street Area

A.5.4.5.1 Description

The St. Botolph Street Neighborhood was created by the coming of the railroad in the 1830's and the landfill of tidal flats surrounding the Boston peninsula which occured later in the 19th Centruy. The area, two blocks long by eight blocks long, is divided from the South End Historic District by the Old Boston and Providence Railroad, now the Penn Central and by the Prudential Complex and the Christian Science Church Center from Back Bay proper.

Most of the present buildings were built in the 1880's. Unlike other sections of the city, these houses were not built by individual architects for individual owners, but by speculators who combined family housing with artist studios, schools, professional offices and hotels. In the main it is row housing of brick and brownstone with eclectic architectural details. Neither as opulent nor as architecturally distinguished as the houses of the Back Bay, nor as homogeneous as the row houses of the South End, it is distinguished itself by its unique mix, which has survived until today.

All of the easterly streets perpendicular to St. Botolph Street are dead end against the Penn Central Tracks with the exception of West Newton Street which serves as the east-west link between the South End and the Prudential Center Complex (Fig. A-5a).

A.5.4.5.2 Effect

The St. Botolph Street area, which is bordered on the east by the South End Historic District, will not be adversely affected by the project. East-west streets in this district are also dead-end against the Penn Central tracks with the exception of West Newton Street (Fig. A-5b).

None of the options and alternatives for this project will require the taking of properties in the St. Botolph Street area.

The preferred alternative, option SC-1, includes construction of walls between buildings at the ends of streets in the St. Botolph Street area. An acoustic deck would be constructed to further shield noise from adjacent houses. The effective noise levels are illustrated on drawings of alternatives PHP-1 and PHP-2. This deck would be capable of supporting use where warranted and would be designed with the advice of local residents and property owners. It would be removable in areas where air-rights development is encouraged at Mass. Avenue and at the Massachusetts Turnpike.

In option SC-2, the transit tracks would be placed in a tunnel below the railroad bed. This option would continue the same railroad conditions in the St. Botolph area as currently exist, except for the benefit of welded steel rails as offset by increased railroad traffic with higher noise levels than those of SC-1, at an increased cost of approximately 20 million dollars. The "no-build" option would leave the residents in the area exposed to current high noise levels (in excess of 100 dbA) and to noise increases which would be the result of increased service on the existing rail facility. Fencing along the railroad would have to be replaced, bridge clearances for AMTRAK Northeast Corridor improvements increased and landscaping provided by other programs, if they were to be accomplished at all.

An additional option which makes use of a 9-foot depression of the rail right-of-way has also been examined as an alternative between Dartmouth Street and Massachusetts Avenue. This would allow the construction of a continuous noise attenuation deck between these points, but would also involve extensive underpinning of buildings in the St. Botolph neighborhood by use of slurry wall techniques, with some degree of uncertainty as to their structural protection. This alternative is expected to increase project costs by approximately $15 million without significant results beyond the proposed alternate which contains continuous noise barriers and an acoustic deck.

A.5.4.6 Dudley Mansion

A.5.4.6.1 Description

The Dudley House at 167 Centre Street in Roxbury (Fig. A-5c) stands on a 17,342 square foot site, 11,552 square feet of which were taken along the westerly part of the site by the Department of Public Works in 1968.

The Dudley House was built in the late 1820's for Hannah and David Dudley, members of an old Roxbury family. It was one of the early suburban estates, backed up to Stony Brook, along the original road leading to Dedham and points beyond. Subsequent development altered the character of the site. Within a decade the railroad was built in Stony Brook Valley; and, when Hannah Dudley died in 1886 and the estate was passed on to her daughter Abby Weld Dudley, it was subdivided into four parcels, which provided sites for much more modest dwellings.

Abby Weld Dudley lived in the house until her death in 1896. In 1897 the house passed from her estate to John J. Williams, the Roman Catholic Archbishop of Boston. At this time it was remodeled to serve as the rectory of All Saints Church, which was situated across from the rectory on Penryth Street. The church has since been demolished as part of the DPW right-of-way takings.

Throughout the century the land surrounding the old estate became increasingly built-up. The church used the house until 1968 when it was taken by the Department of Public Works. It is currently being used as a drug rehabilitation center. The house, in its present use and physical setting, reflects the history and development of that area, both sociologically and physically. The vacant land cleared for I-95 highway construction surrounding the lot to the south across Penryth, to the west along Columbus Avenue, and to the north continuing along the southwest corridor, has been developed for interim park uses by the Peter Bent Brigham Hospital and others in agreement with the Department of Public Works. Located near 167 Centre Street are two playing courts, interchangeable for basketball and tennis, and a small swimming pool.

A.5.4. 6 .2 Effect

None of the Alternatives will adversely affect the Dudley House. In alternatives FH-2, FH-4, FH-5 and PHP-2 the arterial street will abut on the western side of the Dudley House properties. In all cases, however, proposed open development of presently abandoned land, construction of the Roxbury Community College, and proximity to the new Jackson Square Station will increase accessibility to the site.

A.5.4.7 Forest Hills Parkland

Two park areas in the neighborhood of Forest Hills will be affected by the project, namely Franklin Park and the Arnold Arboretum.

A.5.4.7.1 Franklin Field

A.5.4.7.1.1 Description

Franklin Park, the terminus of the Historic Olmsted Park System, is unquestionably one of Olmsted's masterpieces. In 1885, Olmsted designed this large rural park especially for working class people. The largest area of the property, "The Country Park" was reserved exlusively "to provide opportunity for a form of recreation to be obtained only through the influence of pleasing natural scenery upon the sensibilities of the soul quietly contemplating it". Other areas were set aside for sports (the Playstead, on which has been built White Stadium), a deer park, now part of the Zoo, and a playground for small children. The only formal part of the Park is a grand mall, called "The Greeting", designed for use as a promenade and meeting place. The Greeting was never completely planted as planned and has been incorporated into part of the Zoo. Two monuments that Daniel Chester French designed in 1882 for the Boston Post Office are now located at the northern entrance to The Greeting. These groups represent "Labor, Art and the Family" and "Science Controlling the Forces of Steam and Electricity".

The park is still used for horseback riding and Olmsted's road pattern is intact. Much of the fine original stonework remains, although in bad condition. These structures include the Playstead Overlook (1885-1888) and the terraces and arbors on Schoolmaster's Hill (1890-1891), both of which appear on Omsted's 1885 plan, the Valley Gate (1888-1889 by Walker and Best) and several rustic fountains. A State hospital, the Shattuck, has been erected on what was formerly the Heathfield on Morton Street.

A.5.4.7.1.2 Effect

Elimination of surface parking under the overpass at Forest Hills as proposed in the project, creates the opportunity to reinforce the original Olmsted plan for a path connecting Franklin Park and the rest of the park system through the construction of new landscaped bicycle and pedestrian oriented linkages.

A.5.4.7.2 Arnold Arboretum

A.5.4.7.2.1 Descripton

The Arnold Arboretum is in three physical locations: the Case Estates in Weston, the herbarium and library at Harvard University in Cambridge, and the vast living collection of trees and shrubs and administrative offices in Jamaica Plain, Roslindale, and West Roxbury, physically contained within the Arborway to the north and northeast, South Street and the Penn-Central Railroad to the east and southeast, Walter and Weld Streets to the south and southwest, and Centre Street to the west and northwest.

The Arnold Arboretum with its living collection of more than 7,000 different species of trees and shurbs is a unique joint venture of a private institution (Harvard University), a municipal government (the City of Boston), and the public (the individual contributors to the Arnold Arboretum). It is an integral part of the Olmsted Park System and is linked by parkways to the rest of the Metropolitan Park System . In 1965 it was designated a National Registered Historic Landmark for its achievements as a scientific institution dedicated to the study of trees and was automatically placed on the National Register of Historic Places when it was established by the Historic Preservation Act of 1966.

As a scientific institution affiliated with Harvard University, it has made every effort to educate the general public in the care and use of plants, in particular trees and shrubs. At the same time, it has provided a valuable open space and passive recreational area for the metropolitan region that surrounds it. The use of the land is restricted for the purpose of an arboretum and public park.

A.5.4.7.2.2 Effect

Inclusion of landscaped areas in the vicinity of Forest Hills Station as part of the proposed Green Belt system will allow a direct connection to the Arboretum with a clearer, less hazardous movement of pedestrians at street level. In addition, elimination of surface parking under the overpass creates the opportunity to reinforce the original Olmsted plan for a path connecting Franklin Park and the Arboretum through the construction of new landscaped bicycle and pedestrian oriented linkages.

A.5.4.8 Removal of the Elevated Structure

Removal of the Washington Street elevated structure will have a beneficial effect on the following sites by reducing surrounding noise and improving their accessibility.

	Figure No.
Roxbury Highlands Area	See Section A.5.3.6
Eliot Burying Ground (historic site)	A-5aa
Playground for Southwest II High School (under construction)	A-5f
William F. Flaherty Memorial Playground	A-5g
Horatio Harris Park	A-5h
Athletic Facilities at Washington Park	A-5i
Cedar Square Park	A-5j
Derby Park	A-5k
Blackstone Square Park	A-5l
Franklin Square Park	A-5m
Peter's Park	A-5n
Roach's Playground	A-5o
South Cove Plaza	A-5p

Cathedral of the Holy Cross (historic site) A-5q

South End Burying Ground (historic site) A-5r

In all instances steps will be taken during removal of the elevated structure to insure safe access to all adjacent properties.

A.5.5 Property Adversely Affected by the Project

A.5.5.1 Takings in the South End Historic District

As previously mentioned all alternatives in the South End require takings. The following properties will be adversely affected.

18 and 20 St. Charles Street (Fig. A-13c)

St. Charles Street is a predominantly residential block of 3 and 4 story brick bow front houses, which dead ends at existing rail right-of-way (approximately one-story below street level). The continuity of this well-maintained residential enclave is interrupted on the north side of the street by the loading platform for the John Widdicomb and John Stuart warehouse loading dock. The street terminates into the wall of the railroad cut, which is in disrepair and presents, together with the driveway and loading facilities, an unsightly termination to this street.

18 and 20 St. Charles Street are brick bow front buildings typical of bow fronts found throughout the South End. The two four-story buildings abut a row of eight 3-story bow fronts on the east and the existing railroad tracks and Massachusetts Turnpike on the west. They also face the Widdicomb and Stuart loading dock.

Although the two buildings are physically sound, there are hundreds of examples of this building type throughout the South End. The visual continuity of the block would not be substantially altered by the loss of the buildings and the removal of the loading dock improves the appearance of the street and probably displaces a nuisance use caused by the loading dock.

The removal of these structures should be accompanied by appropriate landscaping, grading and paving of the street end and sidewalks to insure the preservation and improvement of the character of the street. In addition, fencing of appropriate cast iron or steel character should preserve the security of the street by limiting pedestrian access. Park spaces should be provided and their care could be entrusted to a residents association. All design work would be coordinated with the local historical society and residents of the street.

18-28 Cazenove Street (Fig. A-13b)

Cazenove Street, although solidly residential is, in contrast to most South End streets, widely varied in building scale and building type and does not conform to the coherent facade pattern so important in the South End. Three of the four corners of this one block street have multi-story apartment buildings, including the Continental Apartments mentioned previously. The middle of the block on the south side of the street is of three-story brick masonry bow fronts. The north side of the street includes three-story bow fronts but there is also a five-unit, two-story flat facade brick masonry structure called the Greenleaf Block.

The two structures to be taken on Cazenove Street are four-story walk-up masonry apartment buildings which abut the Greenleaf Block. The buildings appear to be structurally sound though not outstanding examples of late 19th century apartment construction in the South End. Exterior fire escapes and modifications to the ground floor for security and modernization purposes compromise the buildings asthetically, and destroy the integrity of the facade at street level.

Since Cazenove Street is a block characterized by multiple dwelling types and generally lacking in visual continuity, the loss of these buildings will not substantially affect the historic qualities of the street.

The removal of structures at the northern end of Cazenove Street should be accompanied by appropriate landscaping, grading and paving to insure the preservation and improvement of the character of the street. Fencing of appropriate cast iron or steel should be erected to promote security and neighborhood character. The street should be realigned to provide limited access from Columbus Avenue or dead-ended. Design work should be coordinated with the local historical society and residents of the street.

<u>254-260 Columbus Avenue (Fig. A-13c</u>

This Group of structures includes the Continental Apartments (256), a four-story structure with 3 apartment floors above ground level for commercial uses, a "sub-shop" (254) and an automotive parts store (258-260). Although the Continental Apartments building is perhaps representative of late 19th centruy South End multi-family constructions, it is not unique nor is it any longer a particularly good example. The facade has been significantly altered through the years and the oriel at 254 has been clad with aluminum siding. The integrity of the facade at street level has been totally destroyed via alterations to entrances, windows and brickwork.

<u>389-390 Massachusetts Avenue</u> (Fig. A-13e)

Two vacant structures, formerly containing mixed residential and some commercial ground floor use, are located at the eastern edge of the rail right-of-way at Massachssetts Avenue. These structures are in a blighted condition, with windows boarded. They were acquired by the Boston Redevelopment Authority as part of renewal activities in the South End, for either new construction or rehabilitation. ..

The apartment building at 390 Massachusetts Avenue is a large, 6-story red brick bearing wall structure of some architectural character but with a tenement style plan. Current plans of the Redevelopment Authority would rehabilitate the structure for residential use, if this is economically and structurally possible. Housing uses, if federally subsidized, would require conformance with the Department of Housing and Urban Development's (H.U.D.) noise guidelines. Visual inspection of the rear wall of this structure reveals evidence of vertical shear stresses that have separated portions of this wall.

The apartment building at 389 Massachusetts Avenue is a 6-story structure faced with yellow brick which has a tenement style floor plan. Current plans of the Boston Redevelopment Authority would rehabilitate this structure for residential use if this were economically possible, and if the H.U.D. noise guidelines permitted (they are applicable for residential projects with federal assistance).

It is proposed that these structures be acquired in order to provide for an approximately 4-foot widening of the rail/transit right-of-way. This widening is necessary for the construction of the proposed acoustic deck and walls that would shield occupied structures adjoining the proposed rail/transit facility (these guidelines for new housing to the north of Massachusetts Avenue that would otherwise be non-conforming due to rail/transit induced noise).

It is proposed that an engineering examination be performed to determine the structural feasibility of constructing foundation underpinning and modifications for these structures. If these are found feasible, the structures could be altered and returned to the Boston Redevelopment Authority. Otherwise, the structures would be demolished and the vacant parcels remaining after reconstruction of the proposed rail/transit right-of-way would be returned to the Boston Redevelopment Authority for disposition and development. In addition, air-rights developments over the rail right-of-way would be possible.

Option SC-1 also consists of the construction of a 6 to 7 foot continuous noise wall east of the right-of-way between Dartmouth Street and Massachusetts Avenue, and walls between buildings at the ends of streets in the St. Botolph area. An acoustic deck would be capable of supporting use where warranted and would be designed with the advice of local residents and property owners. It would be capable of removal for air-rights development at Mass. Avenue and the Massachusetts Turnpike. Carleton and Clarement Streets would be rebuilt with new paving, curbs, and landscaping.

A.5.5.1.1 Alternatives to the Proposed Action

The "no build" option would leave the existing district and its residents exposed to current high noise levels (in excess of 100 dbA) and to noise increases which would be the result of increased service on the existing rail facility.

Streets would be repaved under other City of Boston programs as funds might permit.

Fencing along the railroad would have to be replaced, bridge clearances for AMTRAK Northeast Corridor improvements increased and landscaping provided by other programs, if they were to be accomplished at all.

A 9-foot depression of the rail right-of-way has been examined as an alternative between Dartmouth Street and Massachusetts Avenue. This would allow the construction of a continuous noise attentuation deck between these points, but would also involve extensive underpinning of buildings in the St. Botolph neighborhood by use of slurry wall techniques, with some degree of uncertainty as to their structural protection. This alternative is expected to increase project costs by approximately $15 milillion without significant results beyond the proposed alternative which contains continuous noise barriers and an acoustic deck. Its primary benefit would be the decreasing of the apparent height of the wall and deck from adjacent streets and housing.

A.5.5.1.2 Measures to Reduce the Impact of South End Takings

It appears that the required takings would not represent a substantial impact on the South End Historic District provided that certain careful measures are instituted. These measures would include the urban design and landscaping improvements discussed in the locations of demolished structures as well as improvements associated with carefully designed noise attentuation walls and decks at the railroad's right-of-way at the edge of the South End at Carleton and Clarem nt Streets. Reconstruction of these two streets together with the addition of landscaping and fencing would also be part of the proposed project. Exposed party walls of buildings remaining after demolition would be refaced in brick.

In the cases of the Garnet Lounge, the Continental Apartments and the Widdicomb/Stuart building, removal of these structures could clearly strengthen the historic qualities of the area, particularly with treatment of the remaining streetscape via screen planting, earth berming and other landscape and urban design devices. The result of these landscaping and other noise attentuation devices can be an improved interface between the existing residences and the adjacent railroad and Massachusetts Turnpike facilities.

In all instances the State Historic Preservation Officer will be consulted concerning the refacing of end walls adjacent to structures that would be demolished, as well as in the design of landscaped areas and fencing to be placed in the South End. Neighborhood residents and Massachusetts Historical Commission nominees will be invited to review all design proposals. As indicated in Figures A-13f and A-13g representatives of the South End Historical Commission and the Back Bay Architectural Commission concur with the MBTA's evaluation that the proposed measures minimize the impact the proposed project will have on the South End Historic District.

A.5.5.2 Old Police Station No. 10

The Old Police Station No. 10 (Fig. A-18,19) is adversely affected by in all alternatives.

A.5.5.2.1 Description

Old Police Station No. 10, is located at 1170 Columbus Avenue, Roxbury Crossing. It was one of the first municipal structures to be built in Roxbury after its annexation to Boston in 1868. Police District No. 10 was organized August 2, 1869, and the three-story, brick Station House built the following fall at a cost of slightly over $50,000. The Police Department Annual Reports do not record the name of the architect.

Architecturally, the building is a fine example of the late mansard, or "Second Empire," style, with the sensitive and accurate detailing characteristic of this academic phase of nineteenth-century architecture. The exterior of the building appears to be virtually unaltered and in good condition. An inventory of surviving municipal buildings in the city indicates that buildings of comparable quality and in this style remain of this period.

The building is owned by the Massachusetts Department of Public Works and currently occupied by The Third Nail, Inc., a non-profit drug rehabilitation center. The building was unoccupied when the taking occurred. At the time of occupancy the tenant was informed that the structure was to be used for transportation purposes and that any occupancy was clearly to be temporary and at the sole option of the owner.

A.5.5.2.2 Impacts

The level and type of railroad service in the corridor requires that the curvature of the tracks be minimized in order to insure that operating specifications are met.

A.5.5.2.3 Alternatives to the Proposed Actions

Alternatives to the demolition of Police Station No. 10 would consist of revisions to the proposed transit/rail alignment and to the cross-section of the proposed Arterial Street alignment. A revision to the transit/rail alignment would require the acquisition of additional property to the side of the alignment opposite the property (to the west and east respectively) and would adversely impact existing privately owned business properties on Terrace Street in Roxbury and on Amory Street in Jamaica Plain (see Fig. A-19). This alternative would involve the taking of several active businesses because of limitations on the degree of curvature allowable for railroad purposes and the necessity for widening the right-of-way for the addition of the fifth track and station platforms. Further, it would require the expensive relocation of a significant portion of the large Stoney Brook calvert which lies immediately to the west of the proposed alignment.

In Roxbury another alternative would be to significantly narrow the right-of-way of the proposed arterial street (Segment 2). This could only be done by eliminating shoulders, the median strip and left-turn channelization. This would result in serious congestion at the Roxbury Crossing intersection. It should also be noted that alternatives PHP-1 and PHP-2 raise the existing grade at both locations and cover portions of the ground level of the structure.

A third alternative would place the Arterial Street over the depressed rail facility. This would require a significantly deeper cut for the facility and involve great expense since the station at Roxbury Crossing would then require a full mezzanine level for pedestrian circulation.

None of these alternatives to the proposed action is economically nor technically prudent or feasible. Therefore demolition of the structure is necessary. A "no-build" alternative for the Southwest Corridor would leave the structure in its present location.

A.5.5.3 Forest Hills Viaduct

Both options for the Forest Hills Station would affect the Stone viaduct at Forest Hills which is part of the Olmsted Park System. (Fig. A-5, A-13h, A-13c, A-14, A-15, A-16)

A.5.5.3.1 Description

The proposed Orange Line project intersects the Arborway portion of the historic Olmsted Park system at Forest Hills in Jamaica Plain. The Arborway is part of a comprehensive system of parks and parkways designed by Frederick Law Olmsted which includes the Back Bay Fens, the Muddy River, The Riverway Olmsted Park, Jamaica Park, the Jamaicaway, the Arnold Arboretun, and Franklin Park. (Fig. A-14) All of these are on the National Register of Historic Places.

The Arborway extends from Jamaica Pond to the Arnold Arboretum and then corsses the corridor to reach Franklin Park. The "link" consists of an 80 foot wide roadway overpass 48 feet above the street at its crest (pedestrians and bicycles prohibited). Although Olmsted's original plan would have included a vehicular free green parkway link for pedestrians, bicyclists and horseback riders at grade,this idea was never realized. The remains of the system at Forest Hills has been largely obliterated with the existing Forest Hills MBTA line and the complex, confusing intersection of modes of transportation and surface parking underneath the overpass. (Fig. A-13h) Although the overpass provides an uninterrupted vehicular connection between Franklin Park and the Arboretum, there is little visual or physical continuity for pedestrians.

The stone railroad viaducts at Forest Hills, located under the 80 foot wide Morton Street overpass, were part of the original park system. Preliminary drawings were done by Olmsted, Olmsted & Eliot; final plans were done by Shepley, Rutan & Coolidge. Construction was completed in 1896. Reference is made of the arches in the Boston Parks Department's Reports of 1892, 1895, and 1896. Drawings are on file at Olmsted Associates.

A.5.5.3.2 Impacts

Two project alternatives are considered at Forest Hills; one option removes the embankment and places the Orange Line and AMTRAK rails in a semi-depression which passes the Arborway pedestrian path below grade. In the second option the embankment remains as a bridge structure which passes above grade and just below the Arborway overpass. In both options the local street system will be rearranged to create better traffic management, a clearer street pattern and minimal pedestrian vehicular conflicts. Included in each alternative are the relocation of the MBTA's Arborway Green Line track configuration and station at Forest Hills with the net effect of moving that track south and providing a direct transfer to rapid transit, bus and commuter rail operations at the proposed new Forest Hills Station.

Relocation of the existing small Metropolitan District Commission landscaped areas within and surrounding the traffic circle at South Street and under the Arborway overpass would occur. This landscaped area would be vastly increased in size and made more accessible to pedestrians because of its inclusion in the proposed Green Belt system rather than within a small traffic circle. Further, musch of it would be located so as to be contiguous with the land abutting the Arnold Arboretum, so that a direct connection to the Arboretum could be made. Both alternatives require removal of the railroad arches under the Arborway overpass at Forest Hills.

The principal impact on the Arborway system is essentially beneficial in both alternatives. Each provides for a clearer, less hazardous

movement of pedestrians at street level with some shifting of existing landscaped areas. The proposed 500-car parking facility (this facility is not in the Arborway land) could end the present practice of surface parking under the overpass. The elimination of this parking creates the opportunity to reinforce the original plan for a path connecting the Arboretum and Franklin Park through the construction of new landscaped areas now unused or previously eliminated.

In both alternatives, access to the Arnold Arboretum from the station can be made more direct by extending the existing open space to the edge of the relocated Washington Street. Access to Franklin Park could be achieved by a 30-foot green path right-of-way along the southern edge of the MBTA yard. The linkage connecting the extended existing open space of the Arboretum and the 30 foot green path right-of-way leading to Franklin Park occurs at grade using signaled crossings at points of vehicular conflict. A vehicular free pedestrian, bicycle, and bridle path link would be consistent with the original Olmsted Park System and possible in the context of joint land development around the station.

In the proposed Forest Hills Station alternative, the transit and rail tracks would be below the streets of the Arborway. The existing rail embankment and Orange Line transit viaduct would be removed. Elimination of those two structures will significantly improve the visual and physical continuity of the Arborway-Franklin Park link and bring that connection closer to Olmsted's original vision. (Fig. A-15) As indicated in Figure A-14c, the Metropolitan District Commission concurs with the MBTA's evaluation that the proposed project will not have an adverse impact.

A.5.5.3.3 Alternatives to the Proposed Actions

A "no build" alternative would leave the existing facilities at Forest Hills in their present configuration. No adjustments to the existing Metropolitan District Commission park spaces would take place and the existing granite embankment would remain (alternatives FH-3 and FH-4 would remove one face of the existing embankment in sections and would eliminate it at the station itself).

In the "no build" alternative, improvements to street and transit facilities in the area would be extremely limited, and would consist of minor improvements. Small improvements to the continuity of the park system could be made without street relocation.

A.5.5.4 Elevated Structure on Washington Street

All alternatives require removal of the existing elevated structure on Washington Street between South Portal and Forest Hills (see Figs. A-20 through A-29).

A.5.5.4.1 Description

The Orange Line presently operates on an elevated steel structure along Washington Street. There are six stations which serve the elevated along the route. The stations vary in complexity from the simple suspended platform type (Northampton, Fig. A-25) to a combined bus-transit complex at Dudley Station (Fig. A-24).

The elevated Orange Line was constructed using a structural system of two column steel bents supporting four large longitudinal steel girders. They, in turn, carry the ties and track for both the north and southbound Orange Line.

A major portion of the line has been constructed using plate girder bents combined with either plate or truss-type longitudinal girders. A third major section extending north and south of Northampton Street Station is constructed of arched truss bents combined with longitudinal truss girders. In the vicinity of Forest Hills stations, the structural system utilizes steel encased in concrete.

Although the structure is currently being painted, the last general painting of the "El" occurred during the 1930's. The southerly end of the structure from Green Street to Forest Hills was painted in the late 1940's. During the construction of the Massachusetts Turnpike (1962-1965) the portion of the "El" passing over the pike was repainted.

The overall height (from street level to top of rail) varies between 25 and 35 feet. The two-track structure has an overall width which varies between 25 and 45 feet placing columns both in the street and on the sidewalks. At stations, the structure widens to allow for platforms and track curvature.

An elevated railway for Boston was proposed as early as 1879 but was not finally approved until almost twenty years later. Construction on the "Main Line El" (the Orange Line) began in 1899, and the first run was made from Sullivan Square to Dudley Station in June of 1901. The El was extended south to Forest Hills in 1909 and north to Everett in 1919.

The original stations from Charlestown to Dudley were designed in 1901 by Alexander Wadsworth Longfellow (1854-1943), who won against ten other entrants in a competition sponsored by the Boston Elevated Railway Company and judged by the noted architect and educator, W. R. Ware. Longfellow was educated at Harvard, MIT and the Ecole des Beaux-Arts in Paris. On his return to this country, he worked in the Boston office of H. H. Richardson. Wadsworth's best-known buildings are in Cambridge and include the Phillips Brooks House at Harvard (1898) and Agassiz House at Radcliffe College (1904).

Around 1909-10, alterations were made to most of the stations by Robert Swain Peabody, another leading architect of Boston, best known for his residential and institutional architecture but who also designed the Boston and Providence Railroad Station in Park Square (early 1870's), now demolished.

As originally designed, the Longfellow stations had a family resemblance, but no two were exactly the same. (See Fig. A-27). The station designs are marked by a command of academic architectural vocabulary combined with an imaginative and innovative use of motifs and materials. Among the frequently recurring elements are: large sheets of copper molded into classical details; oak panelling; and a repetitive diamond leitmotif which appears to be Longfellow's signature.

Dudley Station was originally the southern terminus of the line. (See Fig. A-28). Remaining from the Longfellow design are the central arcaded space with diamond-paned clerestory windows, hipped roof, and Beaux-Arts cupolas; an original waiting room on the inbound platform, now boarded up; and a switch tower on the elevated loop. In 1909, the line was extended to Forest Hills, and circular waiting rooms, now demolished, were added, presumably by Peabody, on the east and west surface loops.

The elevated structure itself is of aesthetic and historic significance. Its snaking forms and sweeping loops reveal the same turn-of-the century fascination for the machine and its dynamism seen in more famous structures such as the Eiffel Tower and the Brooklyn Bridge.

The importance of the architectural and engineering features of the "El" has not been generally appreciated, and, little by little, details and whole structures have been stripped away or demolished. The casualties within the past few years include Thompson Square and North Station, victims of fire or explosions. Dudley Station is therefore one of the last places where one can still see this distinctive type of design.

A.5.5.4.2 Impacts

The elevated structure is the most dominantly physical feature along Washington Street as it passes through Jamaica Plain, Roxbury and South End communities. Columns conflict with both street and sidewalk travel. Corrosion is prevalent, dripping rust during rain and snow. Noise levels are a substantial 100 dB during transit operations.

For the reasons outlined in Section A.5.5.4.1 above, the original elements of the elevated structure and stations therein merit eligibility to the National Register.

A.5.5.4.3 Other Alternatives to the Proposed Action

The "no build" option would leave the existing area and its residents exposed to current high noise levels and disruption. It is questionable whether or not,regardless of cost considerations, it would be feasible to upgrade the structure so as to provide the increased level of service anticipated for the future, without further increases in the unsuitable environmental conditions associated with such type of structure.

A.5.5.4.4 Measures to Reduce the Impact of Removing the Elevated Structure and Stations

Planning for the removal of the elevated structure and actual staging of the various phases of demolition will be done so as to minimize its effects on the neighboring areas. It is anticipated that the section from Dudley Station south to Forest Hills will be scheduled for removal first.

Figure A-29 shows the approximate boundaries of the Elevated and station sections proposed to be saved. These sections will not be demolished as part of the Southwest Corridor Project. The station is in shabby but restorable condition and would lend itself to a variety of imaginative reuses, such as the ones being proposed by the Museum of Afro-American History.

The final disposition of Dudley Station will also take into consideration the results of a feasibility study currently underway to examine different alternatives to provide Replacement/Transit Improvement services to the areas from South End to Mattapan subsequent to relocation of the Orange Line to the new alignment. Because of its centralized location and significance as a retail center, the Dudley Station area will undoubtedly serve as a major transfer or through point served by whatever replacement service alternative is selected. Therefore, close coordination will be established between the Museum of Afro-American History, the Massachusetts Historical Commission and the MBTA to insure that the sections of Dudley Station considered to be of historical significance are saved and; if appropriate, incorporated into any future transit design in a manner which both preserves its historical importance and serves the new service needs.

None of the remaining structural elements will be saved, except for station railings which are found to be in usable condition for possible incorporation in the design of new stations on the relocated Orange Line. One possible exception exists and that is the removal and renovation of Dover Station to an adjacent site. Decision as to this action will be based on engineering and economic considerations.

A.6 Concurrence of State Historic Preservation Officer

The letter from Mrs. Elizabeth Armadon, State Historic Preservation Officer, and Ms. Marcia Meyers, Boston Landmarks Commission dated August 17,1977 (Fig.A-30) and included in this Appendix,summarizes their findings regarding: a) properties in the project area which may be eligible for inclusion in the National Register; b) properties which would require a Memorandum of Agreement between UMTA and the Advisory Council on Historic Preservation; c) determination of no adverse effect or determination of no effect; and d) properties which would require a 4(f) statement. The preceeding sections in this appendix deal with the findings of the SHPO accordingly. The concurrence of these agencies is indicated in their signatures to the attached Agreement (page A-23c), and in additional letters (Fig. A-31 and A-32).

A.7 Section 4(f) Statement

As indicated in the body of this Appendix, the following 4(f) properties and lands will be affected by the proposed action.

Adverse Effect:

18-20 St. Charles Street

18-28 Cazenove Street

254-260 Columbus Avenue

389-390 Massachusetts Avenue

Old Police Station No. 10

Forest Hills viaduct

Elevated structure and stations on Washington Street

No Adverse Effect:

St. Botolph Street Area

Morgan Memorial Building

90-92 Berkeley Street

Dudley Mansion

Removal Ell Roxbury Highland

Eliot Burying Ground

Cathedral of the Holy Cross

Sparrow Park

Everybody's Park and Basketball Court

Albert Street Playground

McDeavitt Playground

Johnson Playground

Based on the above documentation and supporting information, it is the determination of UMTA, in consultation with the Massachusetts State Historic Preservation Officer that location alternatives to the proposed action are not feasible or prudent because of the extreme cost and community disruption. However, to minimize the impact of U.S. DOT funds on affected 4(f) lands, the mitigation measures described in the body of this document and Section 106 Memorandum of Agreement will be undertaken.

A.8 Section 106 Memorandum of Agreement

The Memorandum of Agreement between the Department of Transportation and the Advisory Council on Historic Preservation pursuant to the legal requirements of Section 106 of the Historic Preservation Act is shown at the end of this appendix. The Agreement indicates steps which will be taken by the MBTA to minimize the impact of the proposed project on the affected properties.

Advisory Council on
Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

MEMORANDUM OF AGREEMENT

WHEREAS, the Department of Transportation, Urban Mass Transportation Administration, proposes to fund the Orange Line Relocation and Arterial Street Construction in Boston, Massachusetts, a project of the Massachusetts Bay Transportation Authority; and,

WHEREAS, the Department of Transportation, Urban Mass Transportation Administration, in consultation with the Massachusetts State Historic Preservation Officer, has determined that this undertaking as proposed would have an adverse effect upon properties that are eligible for and properties that are included in the National Register of Historic Places; and,

WHEREAS, pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320), the Department of Transportation, Urban Mass Transportation Administration, has requested the comments of the Advisory Council on Historic Preservation; and,

WHEREAS, pursuant to the Procedures of the Advisory Council on Historic Preservation (36 C.F.R. Part 800), representatives of the Advisory Council on Historic Preservation, the Urban Mass Transportation Administration, and the Massachusetts State Historic Preservation Officer have consulted and reviewed the undertaking to consider feasible and prudent alternatives to avoid or satisfactorily mitigate the adverse effect; and,

WHEREAS, the Massachusetts Bay Transportation Authority and the Boston Landmarks Commission were invited and participated in the consultation process; now,

THEREFORE:
It is mutually agreed that implementation of the undertaking in accordance with the following stipulations will satisfactorily mitigate any adverse effect on the above mentioned properties.

Stipulations

The Urban Mass Transporation Administration will include the following stipulations in the grant to the Massachusetts Bay Transportation Administration as conditions of the grant for the above-mentioned project:

1. If a property is moved or demolished as a result of this Agreement, the Massachusetts Bay Transportation Authority (MBTA) will conduct archaeological surveys of the vacated lot and the relocation site to determine whether either site contains properties eligible for inclusion in the National Register of Historic Places. UMTA will then

comply with the Council's "Guidelines for Making 'Adverse Effect' and 'No Adverse Effect' Determinations for Archaeological Resources in Accordance with 36 C.F.R. Part 800" (attached), as appropriate.

2. Any properties that are moved as a result of this Agreement will be moved with all reasonable care and under the supervision of the Massachusetts State Historic Preservation Officer (SHPO). The MBTA will submit documentation of the property on its new site to the SHPO and the National Register.

3. If a structure is to be demolished or altered as a result of this Agreement, the MBTA will contact the Historic American Buildings Survey (HABS) or the Historic American Engineering Record (HAER), whichever is appropriate, and, prior to any alterations, follow their directives concerning adequate documentation of the property. This documentation will then be sent to HABS or HAER for their approval and disposition. Notices of demolition shall then be forwarded to the SHPO and the National Register.

4. The Massachusetts Bay Transportation Authority (MBTA) will take measures to reduce noise and vibration to a level that will not impact historic properties. This will be achieved by utilizing proven design and construction techniques in the Orange Line Relocation Project. The following specific recommendations will be implemented when the project has an impact on historic districts or buildings:

a. Welded rail and resilient rail fasteners will be used in all of the railroad and transit alignments which pass historic districts.

b. Those portions of the project constructed at grade and that have noise impact on historic districts and buildings will be treated with acoustically absorptive material.

c. Those portions of the project constructed below grade and that have noise impact on historic districts and buildings will be treated with acoustically absorptive devices to bring noise to acceptable levels. In particular, an acoustically absoptive deck will be installed between the South End and St. Botolph Street areas between Dartmouth Street and Massachusetts Avenue.

d. Foundation underpinning will be used when construction could adversely affect properties eligible for or included in the National Register.

5. The SHPO and the Boston Landmarks Commission (BLC) will have an opportunity to review and comment on the results of all studies required by this Agreement, on any changes from those documented in the EIS in the MBTA's plans affecting the properties mentioned in this Agreement, and on final plans for these properties in those cases where only preliminary plans currently exist. The SHPO and the BLC will submit written comments on changes in the plans within 15 calendar days of receipt. After consultation, if either party notes any objections to the plans as they affect properties included in or eligible for the National Register, the MBTA will, in consultation with the SHPO and prior to taking any action, obtain the Council's comments in accordance with its "Procedures for the Protection of Historic and Cultural Properties" commencing with Section 800.4(e).

6. Nos. 18, 20, 22, 24, 26, and 28 Cazenove Street, 18 and 20 St. Charles Street, 90 and 92 Berkeley Street, 254 and 264 Columbus Ave.

These properties may be demolished by the MBTA after satisfying all applicable requirements in the stipulations above. The MBTA will ensure that:

a. The areas left vacant by these demolitions will be landscaped and fitted with new street furniture, fencing, curbs and paving.

b. All end walls exposed by demolition will be resurfaced.

c. Earth berms and other noise attenuating devices will be installed.

d. In addition to review by the SHPO and the BLC, the South End Historical Society, the Back Bay Architectural Commission, and neighborhood residents will be invited and encouraged to review all design proposals for these mitigating measures.

7. Nos. 389 and 390 Massachusetts Avenue.

The MBTA will ensure that an engineering study will be conducted to determine the feasibility of constructing foundation underpinning and other modifications that may be necessary for the retention of these buildings. The SHPO and the BLC will be afforded an opportunity to review and comment on this feasibility study. If the study concludes that underpinning is feasible, that work will be performed and the structures will be returned to the Boston Redevelopment Agency. If it is not feasible, the buildings may be demolished.

8. Back Bay Historic District and South End Historic District.

The MBTA will consult with the SHPO, the BLC, the SEHC and the BBAC, concerning the design of the new Back Bay Station. These parties will consider the possibility of incorporating various architectural elements from the old station into the design of the new station.

9. Old Police Station Number 10.

MBTA will conduct a feasibility study to evaluate the alternative of moving the structure to another location. The BLC and the SHPO will be afforded an opportunity to review and comment on this feasibility study. If moving the structure is found to be economically and structurally feasible, the building will be relocated subject to the approval of both the BLC and the SHPO. If it is not feasible, the building may be demolished.

10. Forest Hills Stone Viaduct.

a. MBTA may remove the stone viaduct and railroad arches under the Arborway overpass at Forest Hills.

b. MBTA will ensure that the design of the new Forest Hills Station, the relocation of the Metropolitan District Commission landscape areas, and all redesigned street systems will reinforce the the original Olmstead Park plan for an unobstructed "green belt" to connect Franklin Park and the Arboretum.

c. The parking facility proposed in conjunction with the Forest Hills station will be designed in a manner that will avoid any adverse visual effect on the Olmstead Park System or any other property eligible for or included in the National Register of Historic Places.

d. The final design will be reviewed by the SHPO and the BLC.

11. The Washington Street Elevated.

Unless the MBTA determines to leave the Washington Street Elevated intact, the following measures will be implemented:

a. Dudley Station:

(1) Those portions of the Dudley Station that are identified in the MBTA's Replacement Transit Improvement Study as being suitable for continued transportation-related uses will be rehabilitated.

(2) MBTA will study re-use plans for those portions of the Dudley Station that are found unsuitable for continued transportation-related uses. Development of these plans will be coordinated with the Museum of Afro-American History, the SHPO, and the BLC.

b. Dover Station.

MBTA will evaluate the alternative of removing the facade of the Dover Station and incorporating it into another station within the Southwest Corridor Project. The BLC and the SHPO will be afforded an opportunity to review and comment on this feasibility study. If feasible and approved by the BLC and the SHPO, such a project will be implemented. If it is not feasible, the station may be demolished.

c. The remainder of stations on the Washington Street Elevated.

(1) The MBTA will save and incorporate the railings, fences, and other elements of the stations along the Washington Street Elevated into new station designs whenever possible. The re-use scheme for these elements will be coordinated with the BLC and the SHPO. These elements will be stored in a secure place until they are used.

(2) Removal of the elevated structure will be planned and executed to assure minimum disruption to the various properties that are eligible for or included in the National Register.

Robert R. Garvey (date) 2/2/78
Deputy Executive Director
Advisory Council on Historic Preservation

MEMORANDUM OF AGREEMENT
Back Bay Historic District
Urban Mass Transportation Administration

Charles F. Bingman (date) 8 Feb 78
Urban Mass Transportation Administration

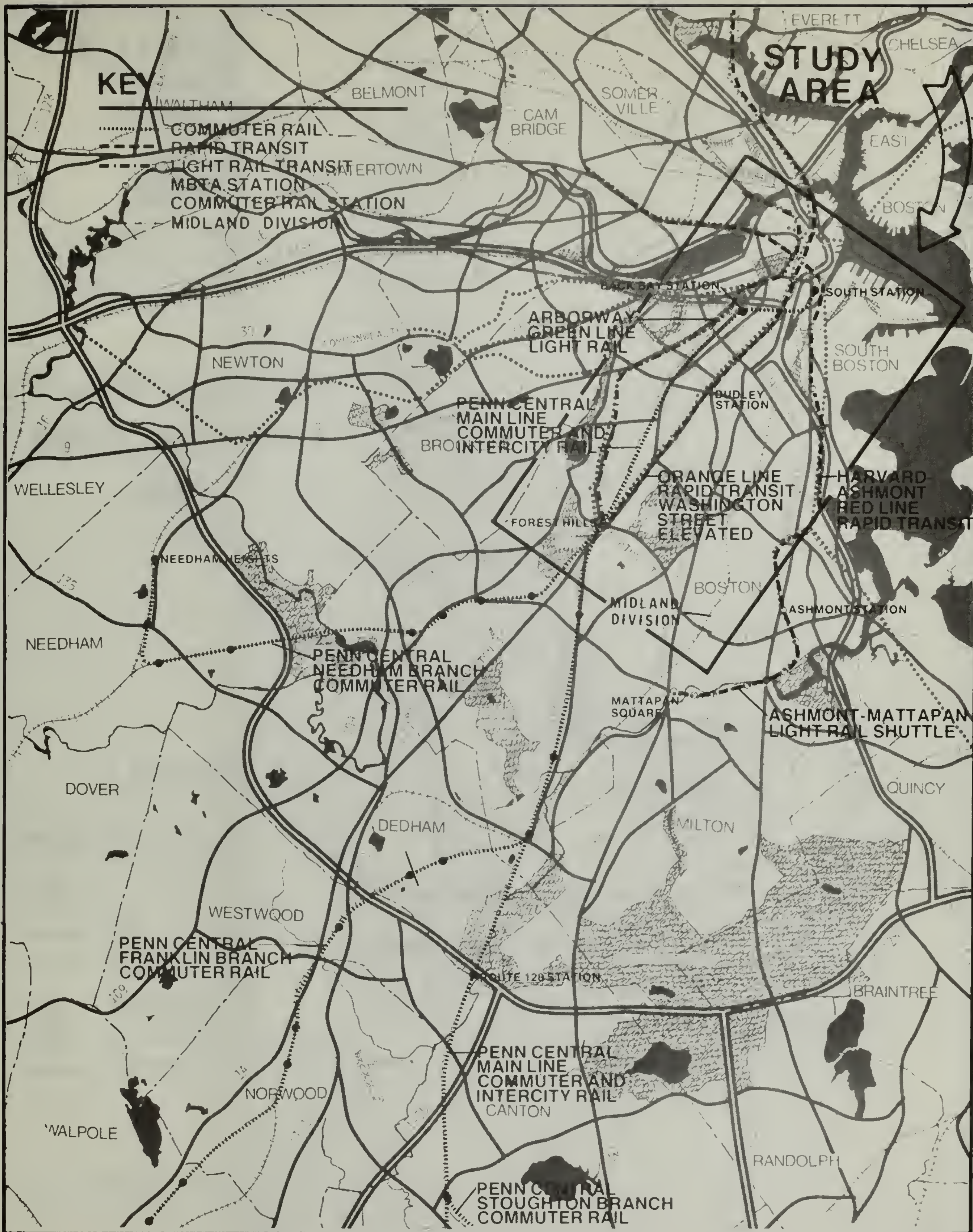
Elizabeth Reed Amadon (date) 2/16/78
Massachusetts State Historic Preservation Officer

(date)
Chairman
Advisory Council on Historic Preservation

Concur:

R R Kiley (date) 2/16/78
Massachusetts Bay Transportation Authority

Marcia Myers (date) 2/16/78
Boston Landmarks Commission



STUDY AREA LOCATION

NORTH

SCALE

0 1 2 3 4 MILES

FIGURE
A–1

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PROJECT LOCATION

RAIL TRANSIT
ARTERIAL

LEGEND

- RELOCATED ORANGE LINE & RECONSTRUCTED RAILROAD
- PROPOSED STATIONS
- EXISTING ORANGE LINE TUNNEL
- EXISTING ORANGE LINE ELEVATED
- EXISTING STATION LOCATIONS
- STATION TO BE REMODELED
- ARTERIAL STREET

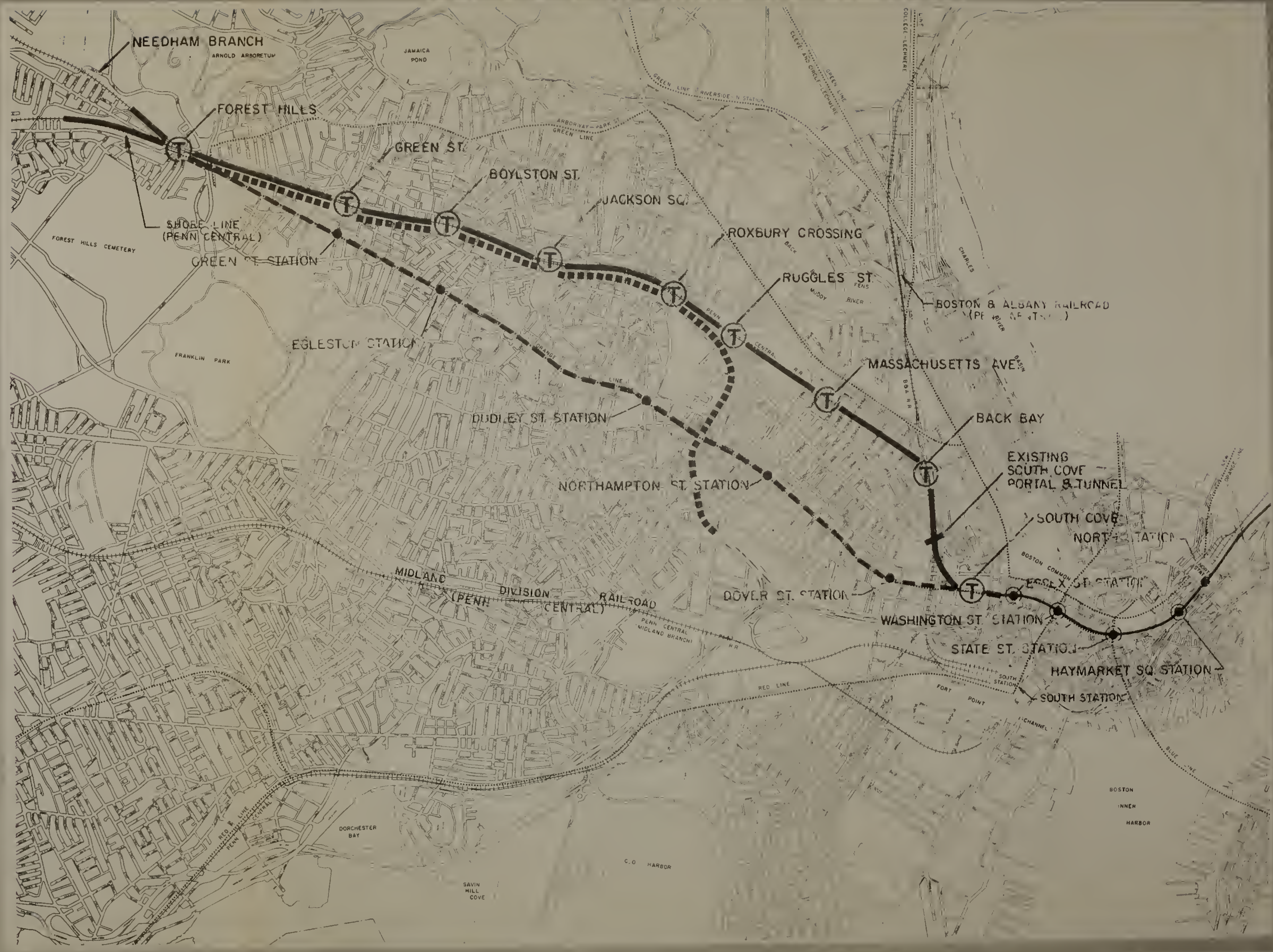
NORTH

SCALE

0 1200 2400 3600

FIGURE

A-2

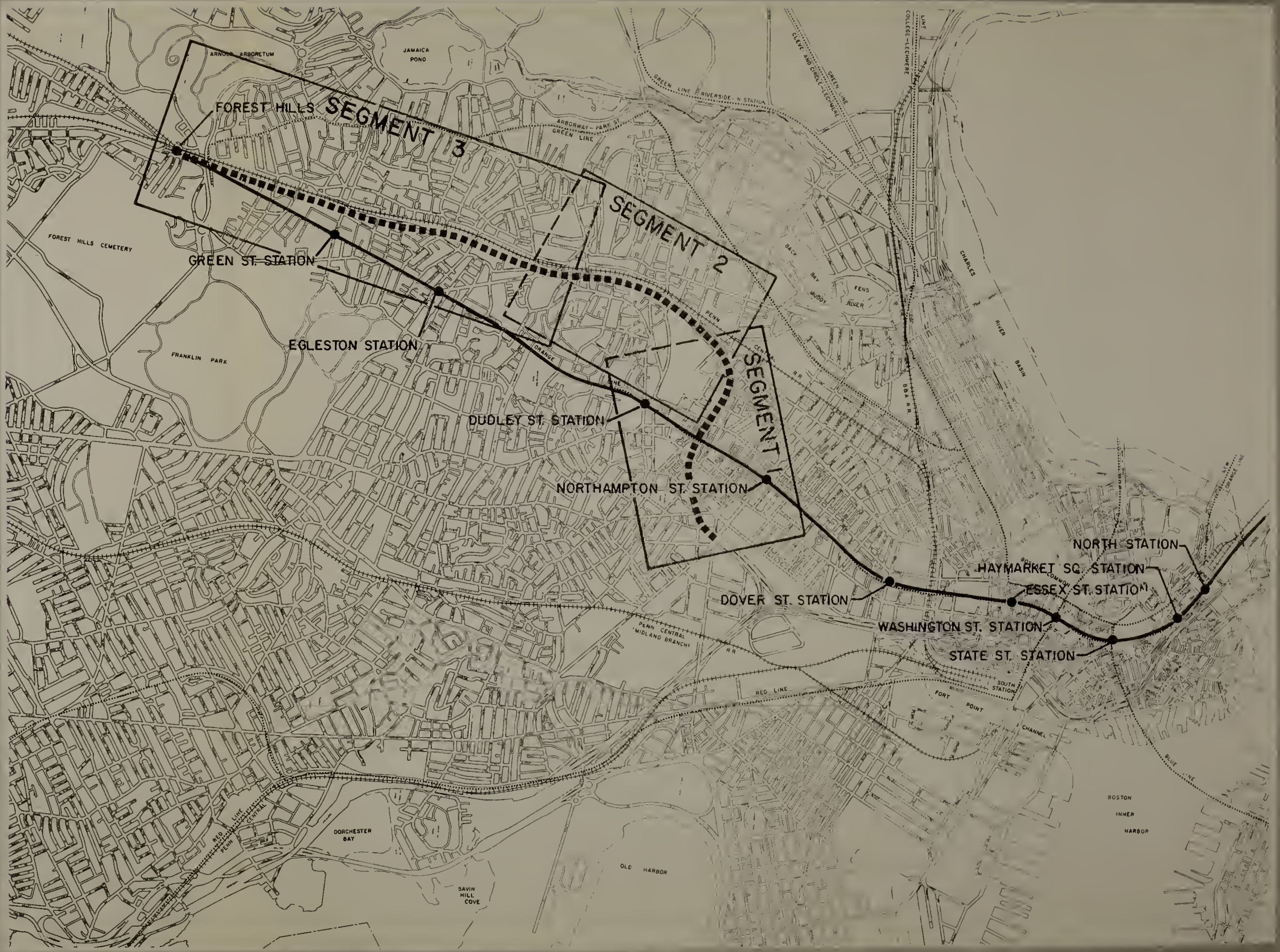


SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

ARTERIAL STREET SEGMENT MAP



LEGEND

▪▪▪▪ ARTERIAL STREET

NORTH

SCALE

0 1200 2400 3600

FIGURE

A-3

(FIG. A-4)

COMBINED ALTERNATIVES	ALTERNATIVE BOUNDARIES & DESIGNATION	
	South Cove to Camden Street	Camden Street to Forest Hills
NO BUILD RAIL/TRANSIT, NO BUILD ARTERIAL STREET	NB-1	NB-1
DEPRESSED RAIL/TRANSIT, NO ARTERIAL STREET	-	FH-1
- with minimum grade adjustments, all tracks	SC-1	-
- with Orange Line in tunnel to Dartmouth Street	SC-2	-
- with Forest Hills Station elevated (option)	-	FH-1a
DEPRESSED RAIL/TRANSIT, ARTERIAL STREET EAST	-	FH-2
- with minimum grade adjustments, all tracks	SC-1	-
- with Orange Line in tunnel to Dartmouth Street	SC-2	-
- with Forest Hills Station elevated (option)	-	FH-2a
- with Arterial to Jackson Square only (2 options)	-	FH-2b, 2c
RAIL/TRANSIT ON MODIFIED EMBANKMENT, NO ARTERIAL STREET	-	FH-3
- with minimum grade adjustments for all tracks	SC-1	-
- with Orange Line in tunnel to Dartmouth Street	SC-2	-
RAIL TRANSIT ON MODIFIED EMBANKMENT, ARTERIAL CROSSING EAST TO WEST	-	FH-4
- with minimum grade adjustments, all tracks	SC-1	-
- with Orange Line in tunnel to Dartmouth Street	SC-2	-
- with Arterial to Jackson Square only (2 options)	-	FH-4a, 4b
MODIFIED-DEPRESSED RAIL/TRANSIT, ARTERIAL STREET EAST	-	FH-5
- with minimum grade adjustments, all tracks	SC-1	-
- with Orange Line in tunnel to Dartmouth Street	SC-2	-
MODIFIED-DEPRESSED RAIL/TRANSIT, NO ARTERIAL OF JACKSON SQUARE	-	FH-6, 6a
- with minimum grade adjustments, all tracks	SC-1	-
- with Orange Line in tunnel to Dartmouth Street	SC-2	-
POST HEARING PROFILE RAIL/TRANSIT, NO ARTERIAL SOUTH OF JACKSON SQUARE	PHP-1	
POST HEARING PROFILE RAIL/TRANSIT, ARTERIAL STREET EAST	PHP-2	

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

4 (F) AND 106 SITES

PUBLICLY OWNED LAND

1 ALBERT STREET PLAYGROUND
2 MCDEAVITT PLAYGROUND
3 JOHNSON PLAYGROUND
3a SPARROW PARK
3b SOUTH COVE PLAZA
3c PETER'S PLAYGROUND
3d ROACH PLAYGROUND
3e BLACKSTONE PARK AND FRANKLIN SQUARE
3f DERBY PARK
3g CEDAR SQUARE
3h WASHINGTON PARK
3i HARRIS PARK
3j FLAHERTY PLAYGROUND
3k SOUTHWEST HIGH SCHOOL II PLAYGROUND
3l WILLIAM E. CARTER PLAYGROUND
3m EVERYBODY'S PARK

PROPERTY IN NATIONAL REGISTER

4 BACK BAY HISTORIC DISTRICT
5 SOUTH END HISTORIC DISTRICT
6 ELIOT BURYING GROUND
7 LOVING GREENHOUGH HOUSE
8 FRANKLIN PARK
9 ARNOLD ARBORETUM
10 OLMSTED PARK AT FOREST HILLS
10a YOUTH'S COMPANION BUILDING

PROPERTY POTENTIALLY ELIGIBLE

11 SAINT BOTOLPH STREET AREA
12 MONUMENT SQUARE AREA
13 DUDLEY/HAMPTON STREETS AREA
14 WINTHROP/WAVERLY/WARREN STREETS AREA
15 ROXBURY HIGHLANDS AREA
16 MISSION HILL CHURCH
17 DUDLEY HOUSE
18 CHESTNUT/LAMARTINE STREETS AREA
19 AMORY STREET WORKERS' HOUSES
20 SEAVERNS STREET WORKERS' HOUSES
21 FOREST HILLS CEMETRY
22 SALVATION ARMY AND CAHNER'S BUILDING
23 JAMAICA PLAIN NEIGHBORHOOD HOUSE
24 ELEVATED STRUCTURE AND STATIONS

FIGURE A-5 [I of III]

SEE LARGER SCALE MAPS
FOR DETAILS OF DISTRIC
BOUNDARIES
SOUTH END
ARTERIAL ST. - ROXBURY
(PROPOSED)
RELOCATED ORANGE LINE
(PRDPDSED)
ROXBURY
WASHINGTON STREET
ORANGE LINE ALIGNMENT
ALTERNATIVE
(NOT UNDER CONSIDERATION)
JAMAICA PLAIN
ARTERIAL ST. - JAMAICA PLAIN
(NOT UNDER CONSIDERATION)
SOUTHWEST CORRIDOR
TRANSPORTATION
IMPROVEMENTS
BOUNDARIES OF
HISTORIC DISTRICTS
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS
FIGURE A-5 [II of III]
0
1200
2400
3600
4800
N

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

BOUNDARIES OF HISTORIC DISTRICTS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

LEGEND

Properties listed in National (1 thru 80) Register of Historic Places

Potentially Elegible Properties (A thru DD)

** Bldgs. and/or Properties included within Project Area

A. HARVARD STADIUM
B. ALLSTON STATION
C. CHESTNUT HILL PUMPING STATIONS
**D. BAY STATE ROAD AREA
**E. MISSION HILL CHURCH
F. DUDLEY MANSION, 167 CENTRE ST.
**G. ST. BOTOLPH ST. AREA
**H. BAY VILLAGE AREA
I. BREED'S HILL AREA
J. DONALD McKAY HOUSE (75-80 WHITE ST.)
K. EAST BROADWAY ST. AREA
**L. DUDLEY & HAMPTON ST. CLUSTER
FIRE HOUSE, CHURCH & CONVENT SCHOOL, POLICE STATION
**M. AMORY ST. WORKERS' HOUSES (200 BLOCK)
**N. CHESTNUT & LAMARTINE STS. AREA
**O. SEAVERNS ST. WORKERS' HOUSES (88, 90, 92)
**P. MONUMENT SQUARE AREA
**Q. FOREST HILLS CEMETERY
R. 1767 MILESTONE
S. CLARK FARM, CORNER HOSMER & NORFOLK
T. LOWER MILLS DISTRICT
U. ASHMONT HILL AREA
V. 2nd CHURCH IN DORCHESTER
W. MELVILLE AVE. WELLESLEY PARK AREA
X. ROSWELL GLEASON HOUSE, N.W. CORNER PARK & CLAYBORNE
Y. MEETING HOUSE HILL AREA
Z. SAVIN HILL PARK AREA
**AA WINTHROP-WAVERLEY-WARREN AREA
**BB ROXBURY HIGHLANDS AREA
CC. NORTH END DISTRICT
DD. WATERFRONT AREA
**EE JAMAICA PLAIN NEIGHBORHOOD HOUSE
**FF SALVATION ARMY AND CAHNER'S BUILDINGS

Source: Boston Redevelopment Authority
(Map of National Register of Historic Places.)

*SIGNIFIES PROPERTY WHICH IS A NATIONAL HISTORIC LANDMARK

1. AFRICAN MEETINGHOUSE, 8 SMITH COURT
**2. ARLINGTON STREET CHURCH
**3. ARMORY OF THE FIRST CORPS OF CADETS
**4. *ARNOLD ARBORETUM
**5. BACK BAY DISTRICT
6. *BEACON HILL HISTORIC DISTRICT
7. BLACKSTONE BLOCK
8. *BOSTON ATHENAEUM, 10½ BEACON STREET
9. BOSTON COMMON AND BOSTON GARDEN
10. *BOSTON LIGHT, LITTLE BREWSTER ISLAND, BOSTON HARBOR
11. *BOSTON NAVAL SHIPYARD
**12. BOSTON PUBLIC LIBRARY
13. *BROOK FARM, 670 BAKER STREET
14. *BUNKER HILL MONUMENT
**15 CROWNINSHIELD HOUSE, 164 MARLBOROUGH STREET
16. *U S.S. CONSTITUTION, BOSTON NAVAL SHIPYARD
**17. CUSTOM HOUSE DISTRICT
**18. CYCLORAMA BUILDING, 543-547 TREMONT STREET
19. DORCHESTER HEIGHTS NATIONAL HISTORIC SITE
20 a. *ETHER DOME, MASSACHUSETTS GENERAL HOSPITAL, FRUIT STREET
b. BULFINCH PAVILLION, MASSACHUSETTS GENERAL HOSPITAL, FRUIT STREET
21. *FANEUIL HALL, DOCK SQUARE
**22. FIRST BAPTIST CHURCH (BRATTLE SQUARE CHURCH)
23. FORT INDEPENDENCE, CASTLE ISLAND
24 *FORT WARREN, GEORGE'S ISLAND
25. FULTON – COMMERCIAL STREET DISTRICT
**26. *GARRISON (WILLIAM LLOYD) HOUSE, 125 HIGHLAND STREET
**27. HALE (EDWARD EVERETT) HOUSE, 12 MORELY STREET
28. *HARDING (CHESTER) HOUSE, 16 BEACON STREET
29. *HEADQUARTERS HOUSE (WILLIAM H. PRESCOTT HOUSE), 55 BEACON STREET
**30. HIGHLAND PARK, ROXBURY
**31. JOHN ELIOT SQUARE DISTRICT
32. *KING'S CHAPEL
**33. KITTREDGE (ALVAH) HOUSE, 10 LINWOOD STREET
34. *LONG WHARF AND CUSTOMHOUSE BLOCK
**35. LORING–GREENOUGH HOUSE, 12 SOUTH STREET
36. *MASSACHUSETTS HISTORICAL SOCIETY, 1154 BOYLSTON STREET
**37. *MASSACHUSETTS STATEHOUSE
38. *OLD CITY HALL
39. OLD CORNER BOOKSTORE (THOMAS CREASE HOUSE)
40. *OLD NORTH CHURCH (CHRIST CHURCH), 193 SALEM STREET
**41. *OLD SOUTH CHURCH, 645 BOYLSTON STREET
42. *OLD SOUTH MEETINGHOUSE
43. *OLD STATEHOUSE
44. *OLD WEST CHURCH, 131 CAMBRIDGE STREET
**45. OLMSTED PARK SYSTEM, ENCOMPASSING THE BACK BAY FENS, MUDDY RIVER, OLMSTED (LEVERETT) PARK, JAMAICA PARK, ARBORWAY, AND FRANKLIN PARK
46. *OTIS (FIRST HARRISON GRAY) HOUSE, 141 CAMBRIDGE STREET
47. OTIS (SECOND HARRISON GRAY) HOUSE, 85 MT. VERNON STREET
48. *PARKMAN (FRANCIS) HOUSE, 50 CHESTNUT STREET
49. PAUL'S BRIDGE, NEPONSET PARKWAY
50. *PIERCE–HICHBORN HOUSE, 29 NORTH SQUARE
51. *QUINCY MARKETS DISTRICT
52. *REVERE (PAUL) HOUSE, 19 NORTH SQUARE
53. *ST. PAUL'S CATHEDRAL, 136 TREMONT STREET
54. SCHOONER ALICE S. WENTWORTH, PIER 4 (SANK)
55. *SEARS (DAVID) HOUSE (SOMERSET CLUB), 42 BEACON STREET
**56. 1767 MILESTONES ALONG OLD BOSTON POST ROAD
**57. *SHIRLEY EUSTIS HOUSE, 31-37 SHIRLEY STREET
**58. SOUTH END DISTRICT
59. TOWN HILL DISTRICT
60. *TREMONT STREET SUBWAY; BENEATH TREMONT, BOYLSTON, AND WASHINGTON STREETS
**61. *TRINITY CHURCH
**62. TRINITY RECTORY
63. AMES BUILDING, ONE COURT STREET
64. BLAKE (JAMES) HOUSE, 735 COLUMBIA ROAD (RICHARDSON PARK)
65. CLAPP HOUSES, 195 BOSTON STREET
66. COPP'S HILL BURYING GROUND
67. DORCHESTER NORTH BURYING GROUND, STOUGHTON AND COLUMBIA
68. KING'S CHAPEL BURYING GROUND
69. PARK STREET DISTRICT
70. PHIPPS STREET BURYING GROUND
71. PIERCE HOUSE, 24 OAKTON AVENUE
72. SUFFOLK COUNTY COURT HOUSE
73. WINTHROP BUILDING
**74. YOUTH'S COMPANION BUILDING (SAWYER)
**75. ELIOT (EUSTIS STREET) BURYING GROUND, EUSTIS AND WASHINGTON STREETS
76. SOUTH STATION HEADHOUSE
77. SYMPHONY & HORTICULTURAL HALLS
78. *SAMUEL GRIDLEY AND JULIA WARD HOWE HOUSE, 73 CHESTNUT STREET
79. *WILLIAM MONROE TROTTER HOUSE, 97 SAWYER AVENUE
80. *WILLIAM C. NELL HOUSE, 3 SMITH COURT

FIGURE A-5 [III of III]

(FIG. A-5a)

STREETS IN ST. BOTOLPH STREET AREA
Perpendicular to the Project Alignment

Blackwood St.

Follen St.

Durham St.

West Newton St.

(FIG. A-5aa)

ELIOT BURYING GROUND

(FIG. A-5b)

STREETS IN THE SOUTH END HISTORIC DISTRICT
Perpendicular to the Proposed Alignment

Holyoke St.

West Rutland St.

Greenwich St.

Clairmont St.

Wellington St.

West Newton St.

(FIG. A-5c)

DUDLEY HOUSE (167 CENTRE ST.)

(FIG. A-5d)

AMORY ST. WORKER'S HOUSE

(FIG. A-5dd)

JAMAICA PLAIN NEIGHBORHOOD HOUSE (OLD BREWERY)

(FIG. A-5e)

SEAVERNS ST. WORKER'S HOUSE

(FIG. A-5f)

SOUTHWEST II HIGH SCHOOL PLAYGROUND (under construction)

(FIG. A-5g)

WILLIAM F. FLAHERTY MEMORIAL PLAYGROUND

(FIG. A-5h)

HORATIO HARRIS PARK

(FIG. A-5i)

WASHINGTON PARK ATHLETIC FACILITIES

(FIG. A-5j)

CEDAR SQUARE PARK

(FIG. A-5k)

DERBY PARK

(FIG. A-5 l)

BLACKSTONE SQUARE PARK

(FIG. A-5m)

FRANKLIN SQUARE PARK

(FIG. A-5n)

PETER'S PARK

(FIG. A-5 o)

ROACH'S PLAYGROUND

(FIG. A-5p)

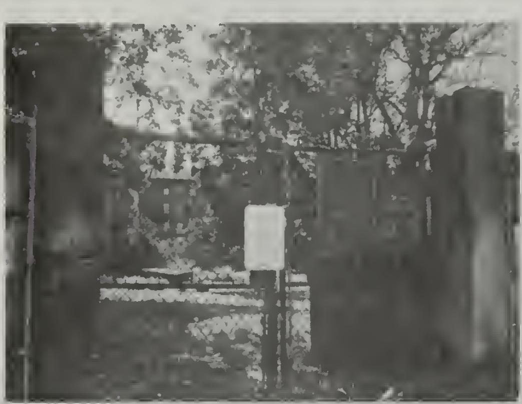
SOUTH COVE PLAZA

(FIG. A-5q)

CATHEDRAL OF THE HOLY CROSS
Historic Site

(FIG. A-5r)

SOUTH END BURYING GROUND
Historic Site



(FIG. A-5s)

SALVATION ARMY BUILDING
147 Berkely St.

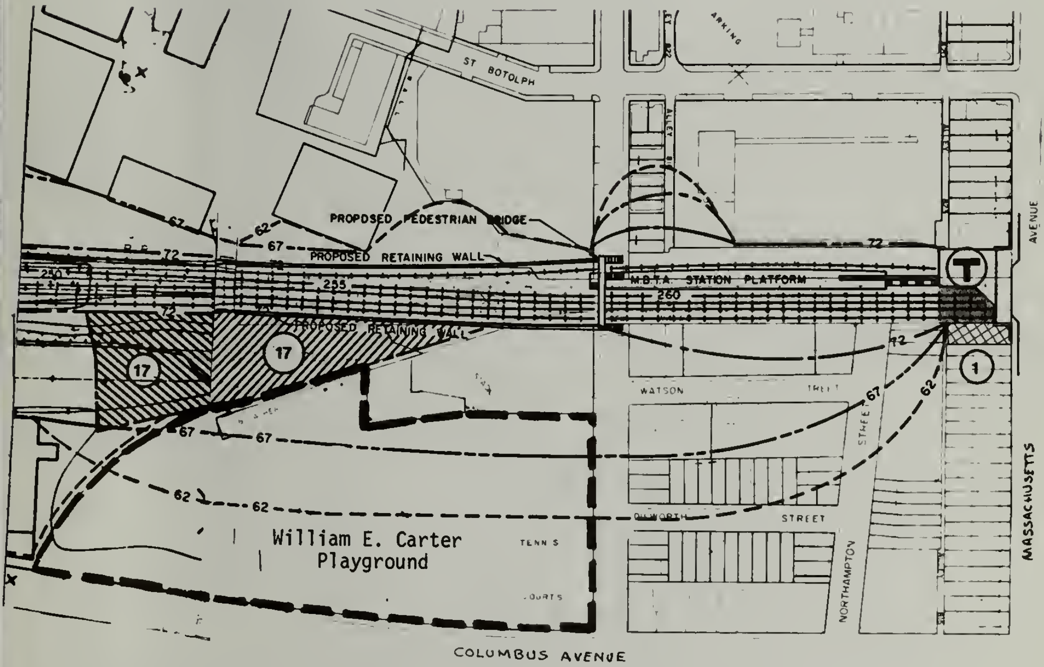
(FIG. A-5t)

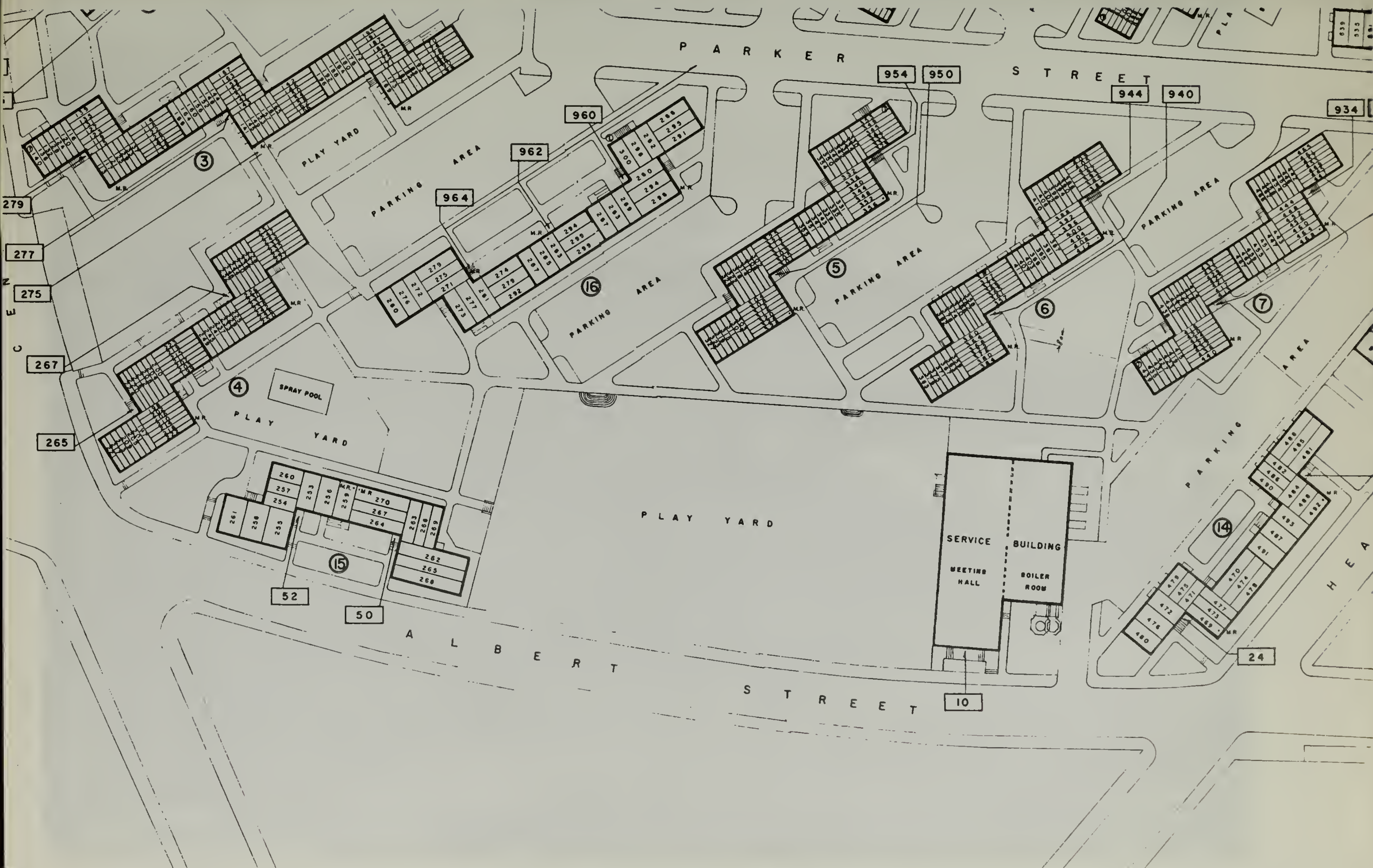
CAHNER'S BUILDING AND YOUTH'S COMPANION BUILDING

209 and 221 Columbus Ave.

(Fig. A-5u)

WILLIAM E. CARTER PLAYGROUND





ALBERT STREET PLAYGROUND

(FIG. A-6)

Albert Street Playground

FIG. A-7

BOSTON HOUSING AUTHORITY
53 State Street
Boston, Massachusetts 02109

Samuel Thompson, Administrator
617-227-3850

October 22, 1976

Mr. Anthony Pangaro
Manager of Southwest
Corridor Development
MBTA
8 Asticou Road
Jamaica Plain, MA. 02130

Dear Mr. Pangaro:

This letter is in response to your request for statement of significance of certain lands of the Boston Housing Authority as they relate to section 4(f) of the Department of Transportation Act of 1966. The Albert Street Playground at the Bromley Park Housing Project and the Mission Hill Extension Housing Project are owned by the Boston Housing Authority.

The proposed MBTA and MDPW plans in the post-hearing profile for the right-of-way segments adjacent to these two Housing Authority Projects do not appear to have an adverse impact upon these facilities. The plans call for decking over a depressed right-of-way and for the creation of recreation space on the decks. At the Albert Street Playground every possible effort should be made to link the present playground to the expanded recreational area on the deck. In order to avoid adverse impact, the regrading of the playground must include the replacement of play surfaces, fencing and equipment. This regrading will be necessary in order to maintain visual surveillance of the existing park deck.

At Mission Hill Extension the transition from recreational space on the deck to the residential environment at the project must be carefully designed to provide the proper transition and visual access between the Housing and its open spaces and the new deck. In both locations, pedestrian access ways from within the housing developments to the transit stations must be designed to provide security and convenience for patrons of the transit system. All regrading caused by the transit project must be accompanied by appropriate lighting, fencing and landscaping.

FIG. A-8

The Authority will be pleased to work directly with you and your staff to assure that the Southwest Corridor Project will enhance the environment at the BHA facilities at these two locations. We are confident that the current post-hearing profile for the right-of-way will permit us to accomplish these effects on the adjacent BHA properties.

Sincerely yours,

Samuel Thompson

Samuel Thompson
Administrator

ST/cf

FIG. A-8, Cont.

The Commonwealth of Massachusetts

Metropolitan District Commission

20 Somerset Street, Boston 02108

John F. Snedeker
Commissioner

May 7, 1976

Mr. Warren Higgins
Director of Construction
Massachusetts Bay Transportation Authority
500 Jamaicaway
Jamaica Plain, Massachusetts

Dear Mr. Higgins:

In response to your request for statements of significance of certain lands of the Metropolitan District Commission as they relate to Section 4(f) of the Department of Transportation Act of 1966, the Thomas J. McDevitt Playground at Boylston and Lamartine Streets, Jamaica Plain, it owned but no longer operated, as a play area by the Commission. The site was abandoned shortly after the Interstate 95 corridor was designed and the Department of Public Works proposed to acquire the playground for highway purposes.

McDevitt was originally equipped for young children with swings, seesaws etc. on a paved surface. It lacked landscaping, was too small for sandlot games and was dangerously close to the busy intersection of Boylston and Lamartine Streets. It was however a well used playground, in the late 1950's.

As noted in the MDC's letter of 15 September 1972 to Mr. John Wofford of the Boston Transportation Planning Review, McDevitt Playground is a difficult problem in terms of 4(f) review. It was at best a marginal recreational facility and significant land use changes in the area have occurred since the playground was developed in 1957. New construction and land use plans for the corridor presents opportunities for far more desireable open space and recreational facilities with better access from the adjacent neighborhood.

The Commission supports these efforts as a means of better serving the needs of the neighborhood.

Sincerely,

John F. Snedeker

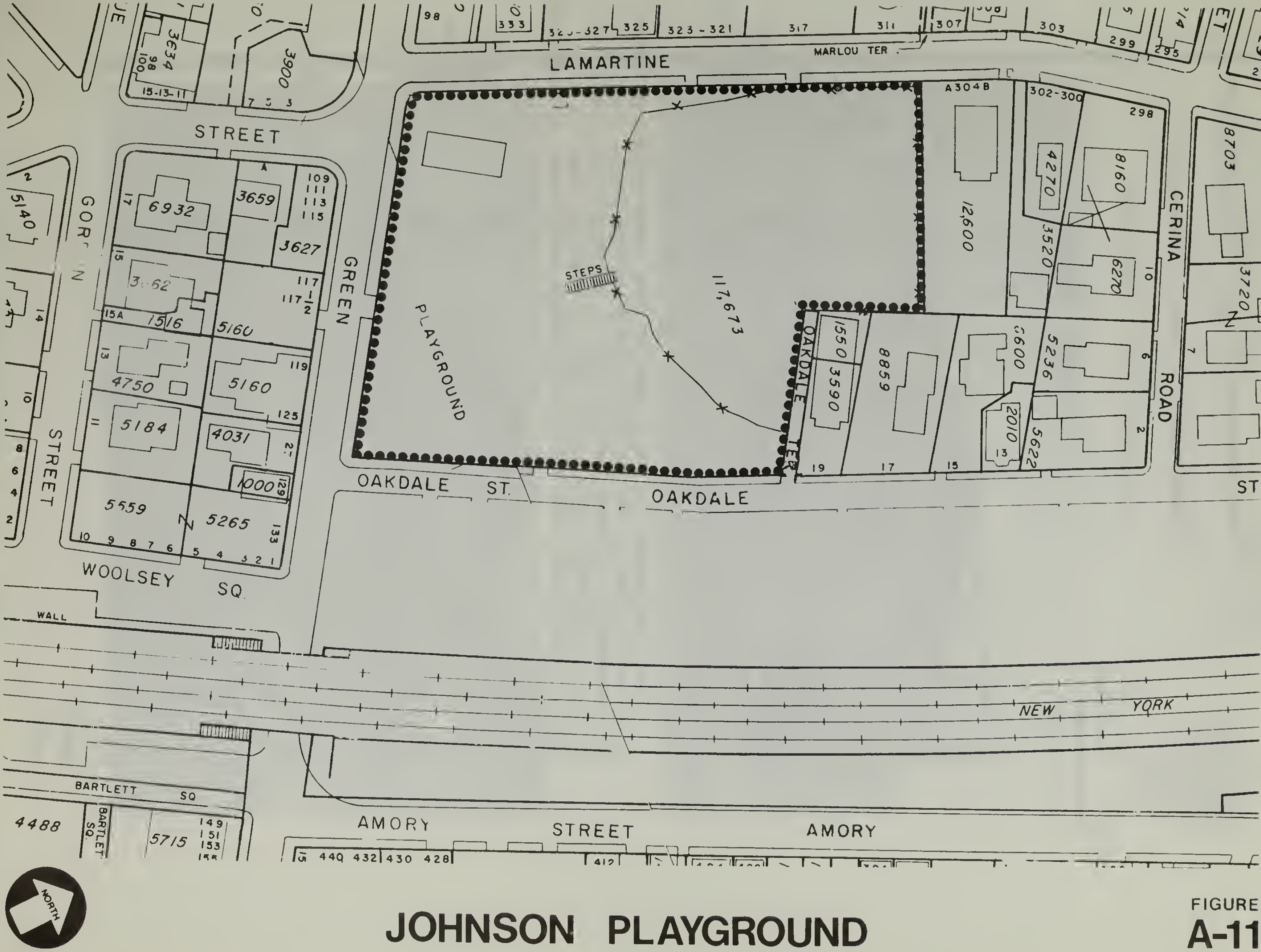
JOHN F. SNEDEKER
Commissioner

JBOB/S

FIG. A-9

Johnson Playground

FIG. A-10



JOHNSON PLAYGROUND

FIGURE
A-11

The Commonwealth of Massachusetts

Metropolitan District Commission

20 Somerset Street, Boston 02108

John F. Snedeker
Commissioner

September 30, 1976

Mr. Warren Higgins
Director of Construction
Mass. Bay Transportation Authority
500 Jamaicaway
Jamaica Plain, Massachusetts

Dear Mr. Higgins:

In response to your request for statements of significance of certain lands of the Metropolitan District Commission as they relate to section 4(f) of the Department of Transportation Act of 1966, the Joseph E. Johnson Playground consisting of some 2.5 acres located between Lamartine and Oakdale Streets at Green Street is owned and operated as a playground by the Commission.

The playground is well-used by the surrounding neighborhood; particularly the ballfield and wading pool. While it is essentially a local rather than a metropolitan facility, it is an important open space and recreation area in a densely developed community that lacks sufficient alternative facilities.

As shown at the present time the various plans do not appear to adversely impact the playground. Indeed the opportunity may exist to improve access to the park and to restore and relandscape the playground as part of the overall transportation improvements. Any major alterations such as filling must be carefully controlled to retain as much of the park as possible in recreational use.

The Commission looks forward to working with you in assuring continued quality open space at Johnson Playground.

Sincerely yours,

John F. Snedeker

JOHN F. SNEDEKER
Commissioner

JBOB/S
MFC

FIG. A-12

(FIG. A-13)

BACK BAY STATION

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

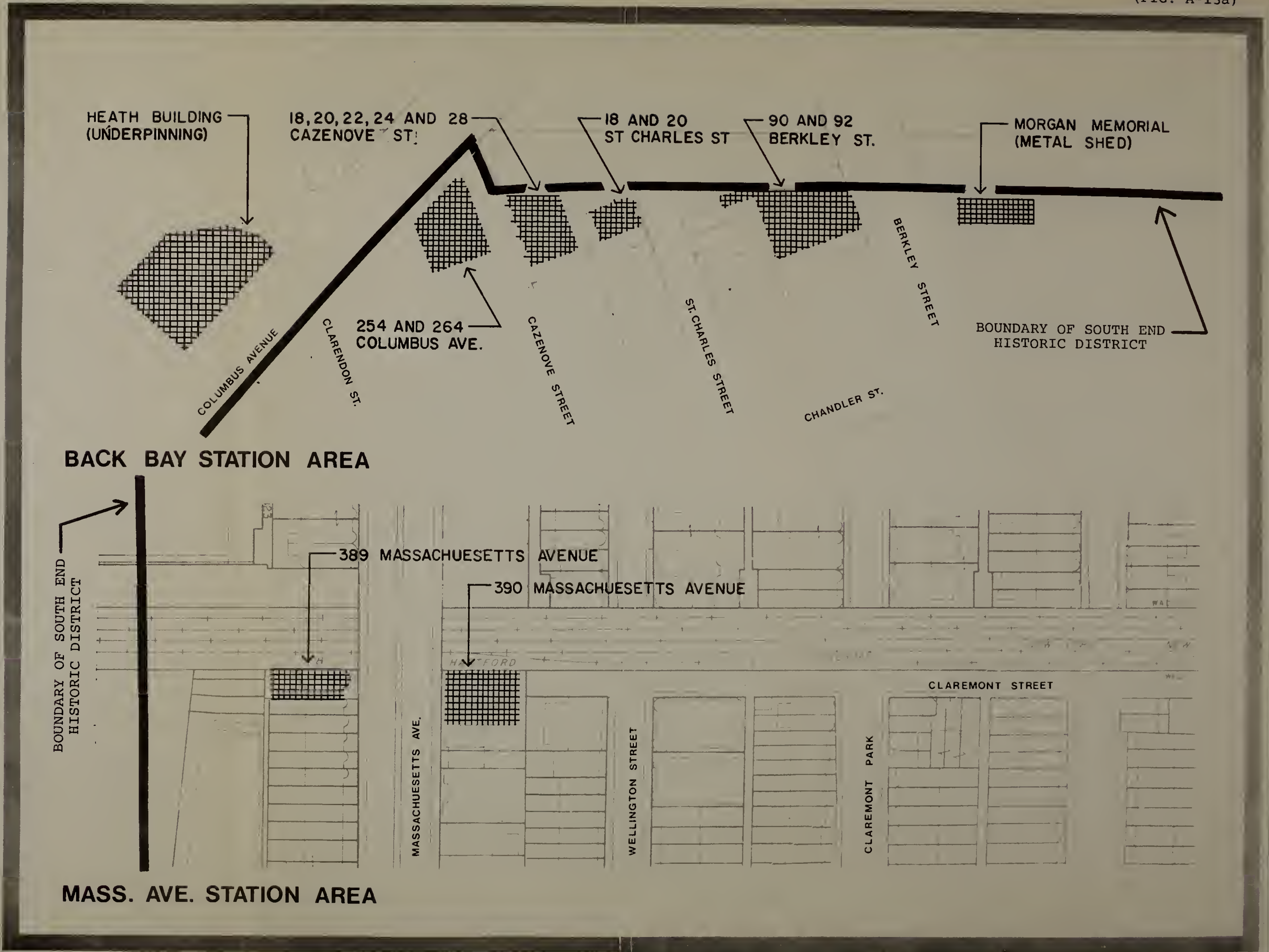
ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

STRUCTURES TO BE ACQUIRED

SCALE
0 100 200 300

FIGURE
A-13a



FREDERIC R. HARRIS INC

(FIG. A-13b)

18, 20, 22, 24, 28 Cazenove Street and Neighboring Area

90, 92 Berkley Street and Neighboring Area

(FIG. A-13c)

18, 20 Charles Street and Neighboring Area

254, 264 Columbus Avenue and Neighboring Area

(FIG. A-13d)

Morgan Memorial

Heath Building and Neighboring Area

(FIG. A-13e)

389 Massachusetts Ave. and Neighboring Area

390 Massachusetts Ave. and Neighboring Area

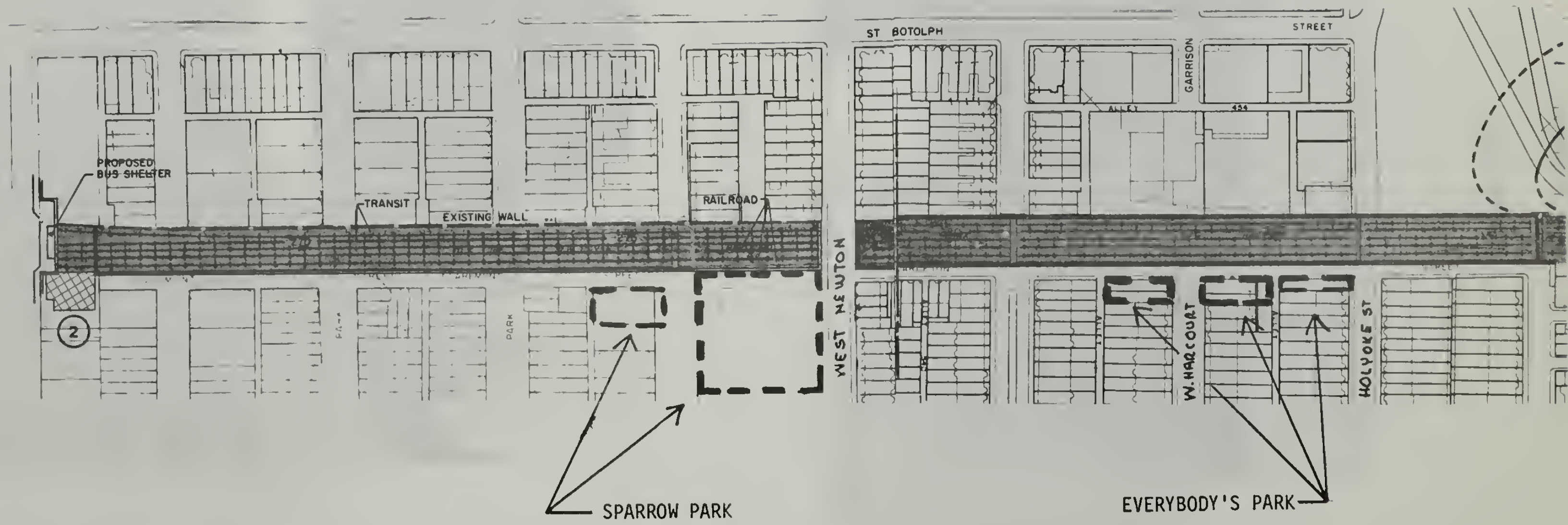
(Fig. A-13ee)

SPARROW PARK

EVERYBODY'S PARK

(Fig. A-13eee)

LOCATION OF SPARROW PARK AND EVERYBODY'S PARK



SOUTH END HISTORICAL SOCIETY, INC.
532 MASSACHUSETTS AVENUE, BOSTON, MASSACHUSETTS 02118

June 22, 1976

Mr. Frederick P. Salvucci, Secretary
Executive Office of Transportation and Construction
One Ashburton Place   16th Floor
Boston, Massachusetts 02108

Dear Secretary Salvucci:

The South End Historical Society supports the application of the MBTA for a federal capital improvement grant of $313,418,498 for new rail facilities in the Southwest Corridor. The South End represents the largest remaining planned Victorian community in this country and as such has been recognized as a National Register District. We assume that the project will be reviewed by the Massachusetts Historic Preservation Office, Elizabeth Amadon, although this is not mentioned in the preliminary impact statement. It is therefore critical that items of the proposed project be designed to be compatible in scale with the surrounding brick residences dating from the mid-1800's. To achieve this goal we recommend that the process of neighborhood involvement as initiated in the preliminary planning stages continue throughout the development of the project.

As the "Local Historical Society" for the South End, we offer the following comments and support on specific aspects of the design as proposed to date:

A. South Cove Portal to Back Bay Station

1) We support the selection of Proposal SC-2 for a tunnel in this area, both to prevent demolition of existing housing on Cazenove and St. Charles Streets and also to limit the width of on-grade track which will further separate the South End from downtown Boston.

FIG. A-13f

2) We support the use of appropriate and compatible landscaping, screening and track covering in this unique small scale residential zone.

B. Back Bay Station

1) The South End Historical Society requests that one of its members be on the designer selection committee for this key element in the proposed system, whether for rehabilitation or new construction. A suggestion of this type was made by the Boston Transportation Planning Review at a presentation to the South End Historical Board of Directors.

2) If a new station is required at Back Bay, we would recommend incorporating the existing iron and glass canopy along the south side of the structure into the new design.

C. Back Bay Station to Massachusetts Avenue

1) We basically support the goals and recommendations of the South End/ St. Botolph Street Task Force. In particular we feel that a cover (scaled to surrounding buildings) to alleviate the visual and noise intrusion of the new service is necessary. Rebuilding and redesign of Claremont and Carleton Streets with appropriate brick walls, iron fence and landscaping, on both sides of the right of way, is necessary to provide minimum intrusion into this National Register District.

2) We recommend that the structure on the East side of Massachusetts Avenue next to the tracks be retained as it provides continuity to the street in both scale and texture. The structure on the west side should, if possible, be utilized for the proposed station or at least the new station must continue the scale and massing of the adjacent structures.

We have assumed, as outlined in the preliminary impact statement report, that all measures possible, i.e. new welded track and roadbed, etc., will be taken to solve sound, drainage and other environmental impact problems.

Mr. Frederick P. Salvucci, Secretary
Executive Office of Transportation and Construction
June 22, 1976
Page Three

One important item, not covered in this report, is the disposition of the existing copper clad stations on the Orange line at Dover and Northampton Streets. We recommend that they be incorporated into the new stations or pedestrian overpasses.

We look forward to the success of this most significant project which we feel will further revitalize and enhance the South End neighborhood, while preserving its historic character.

Very truly yours,

SOUTH END HISTORICAL SOCIETY, INC.

James G. Alexander

James G. Alexander, President

a/s

cc: Tony Pangaro,
Boston Central Transportation Planning Systems

Board of Directors,
Massachusetts Bay Transportation Authority

DONALD F. WINTER, Chairman
CLIFFORD deBAUN, Vice Chairman

MACE WENNIGER, Executive Secretary
Tel. 722-4300, Ext. 304, 305

CITY OF BOSTON
BOSTON REDEVELOPMENT AUTHORITY
BACK BAY ARCHITECTURAL COMMISSION
(CHAPTER 625, ACTS OF 1966)
NINTH FLOOR
ONE CITY HALL SQUARE
BOSTON, MASSACHUSETTS 02201

October 18, 1976

Mr. Peter C. Calcaterra
Assistant Project Manager
Southwest Corridor Development
500 Arborway
Boston, Massachusetts 02130

Dear Mr. Calcaterra:

On behalf of the Back Bay Architectural Commission I have reviewed the material which you forwarded regarding the demolition of Back Bay Station and the construction of a new rail and transit facility on its site.

It is apparent that the Southwest Corridor project will impact upon the South End historic district - although the impact may be insignificant or not adverse.

It is also apparent that the site of Back Bay Station and the locus of right of way realignments are outside the Back Bay Architectural District. Nonetheless, there will be some impact on the District because of the location of the site in question and the fact that the new station will give many visitors their first impression of the Back Bay.

As suggested by the Massachusetts Historical Commission, I shall be pleased, on behalf of the Back Bay Architectural Commission, to participate in the review of designs for the Back Bay Station.

Very truly yours,

Donald F. Winter

DFW/gmf

FIG. A-13g

The Arborway

(FIG. A-13h)

(FIG. A-13i)

STONE RAILROAD VIADUCT AT FOREST HILLS

FIGURE A-14

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

OPEN SPACE PLAN

- (H) HISTORIC STRUCTURE
- (I) INSTITUTION
- (R) RECREATION FACILITY
- (C) COMMUNITY SERVICE FACILITY

←•••• PRIMARY PATH (BICYCLES/PEDESTRIANS)

←······ SECONDARY LINKAGES

SCALE

0 1200 2400 3600

NORTH

FIGURE

A-14

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

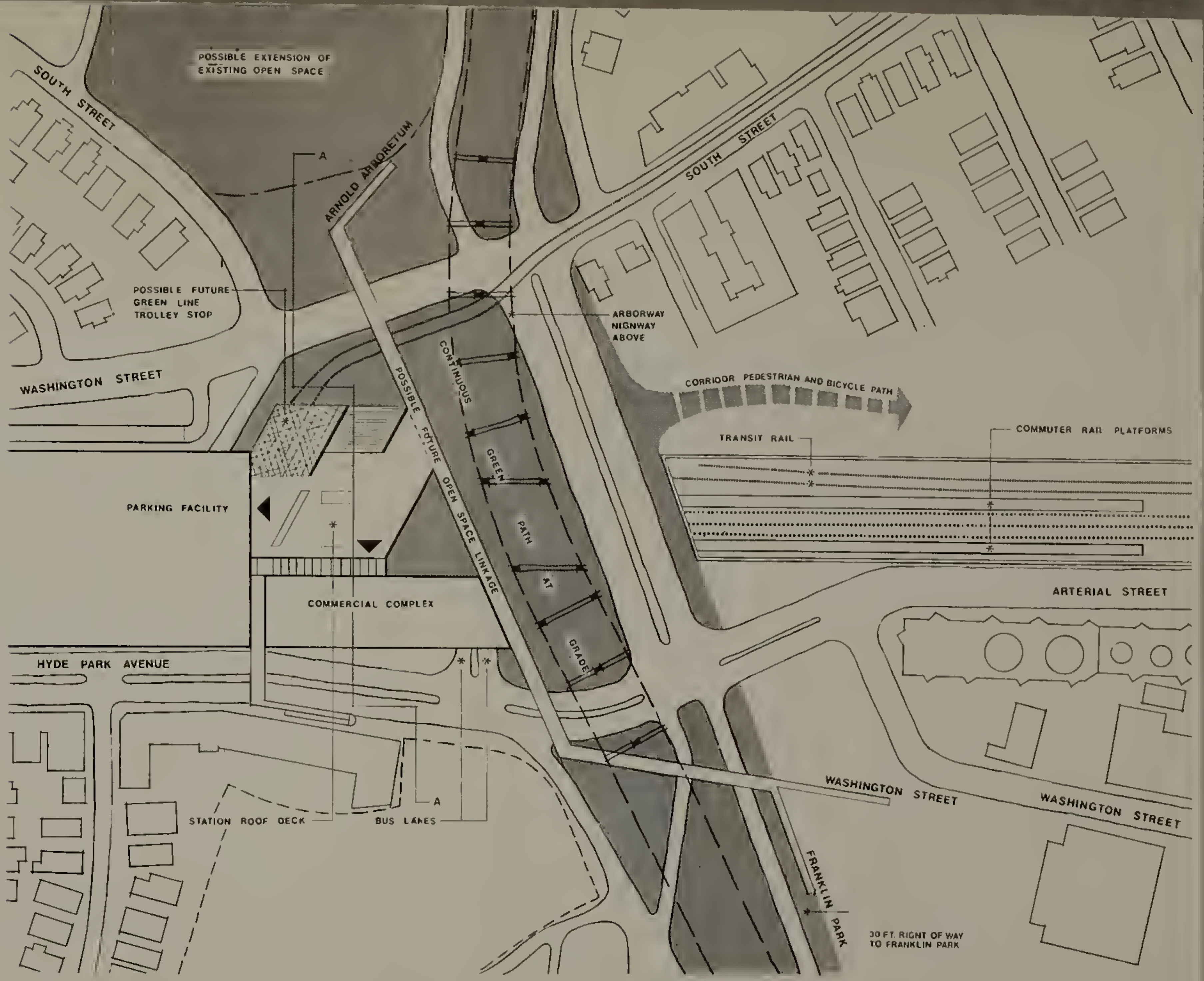
ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

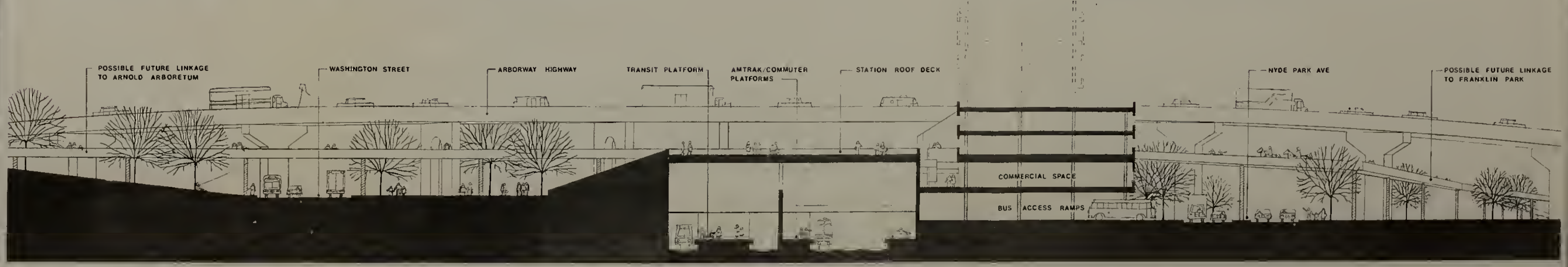
FOREST HILLS STATION AREA

SECTION 4-F, 106

THE ARBORWAY (OLMSTED PARK SYSTEM)



STATION OPEN SPACE PLAN



SECTION A

NO SCALE

FIGURE A-15

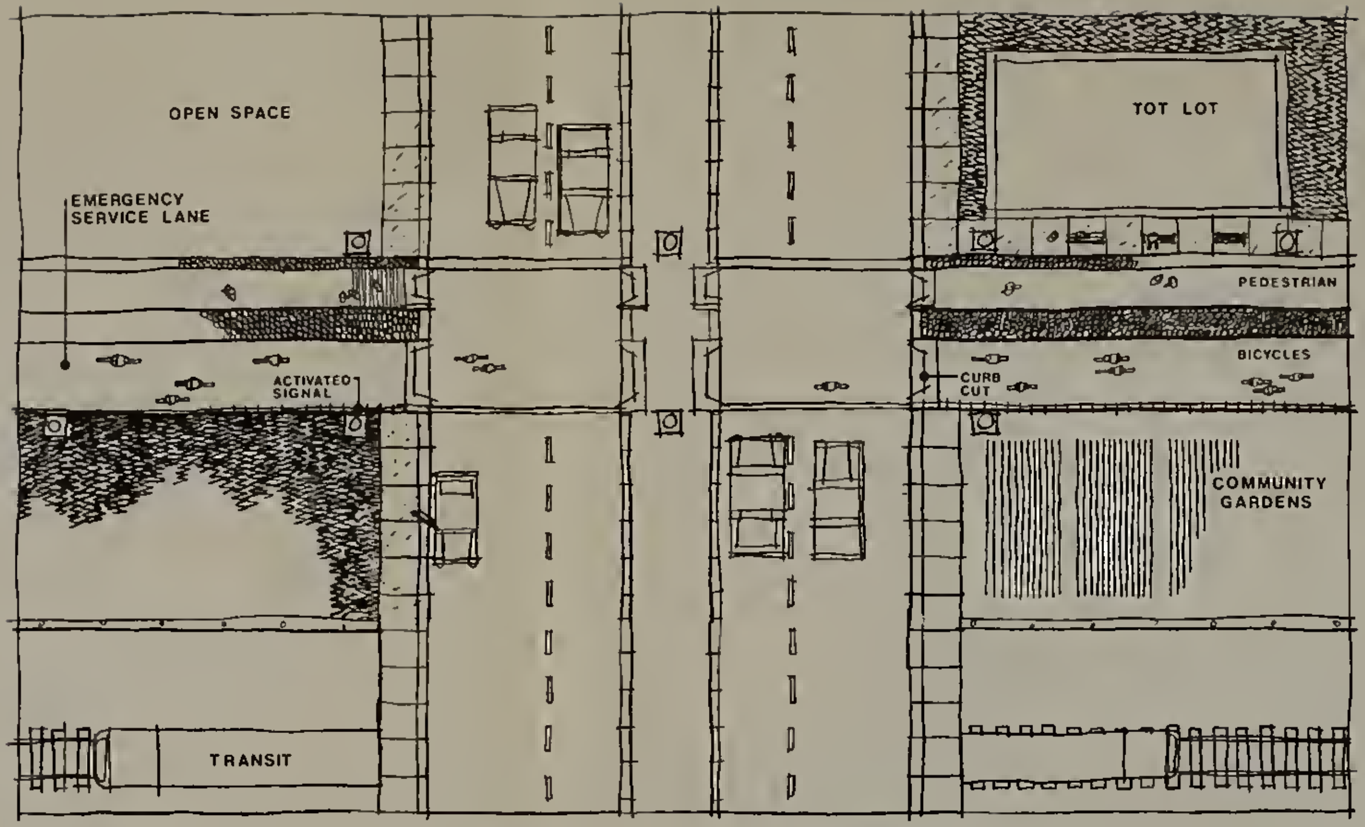
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

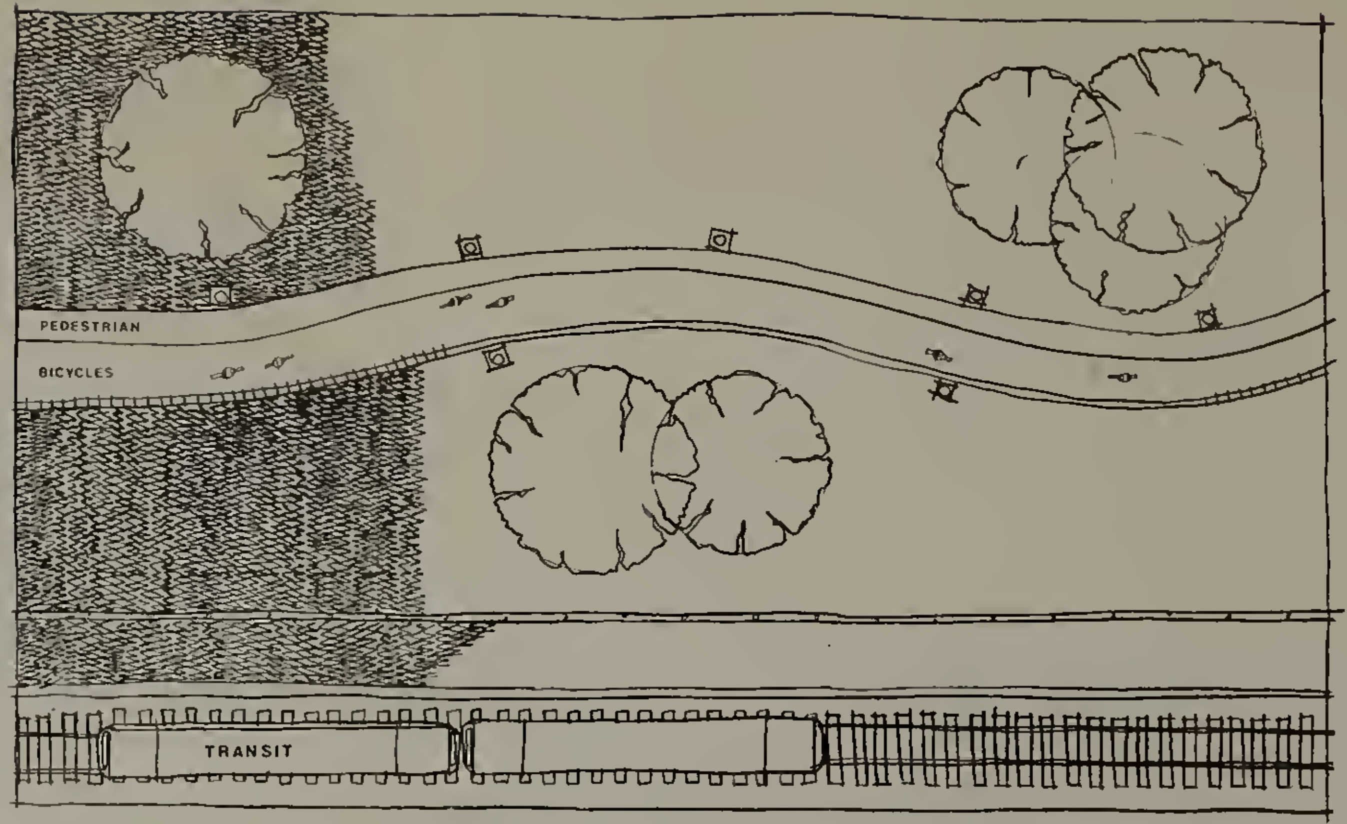
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PROPOSED PEDESTRIAN, BICYCLE PATH

ARCHITECTURAL DETAILS

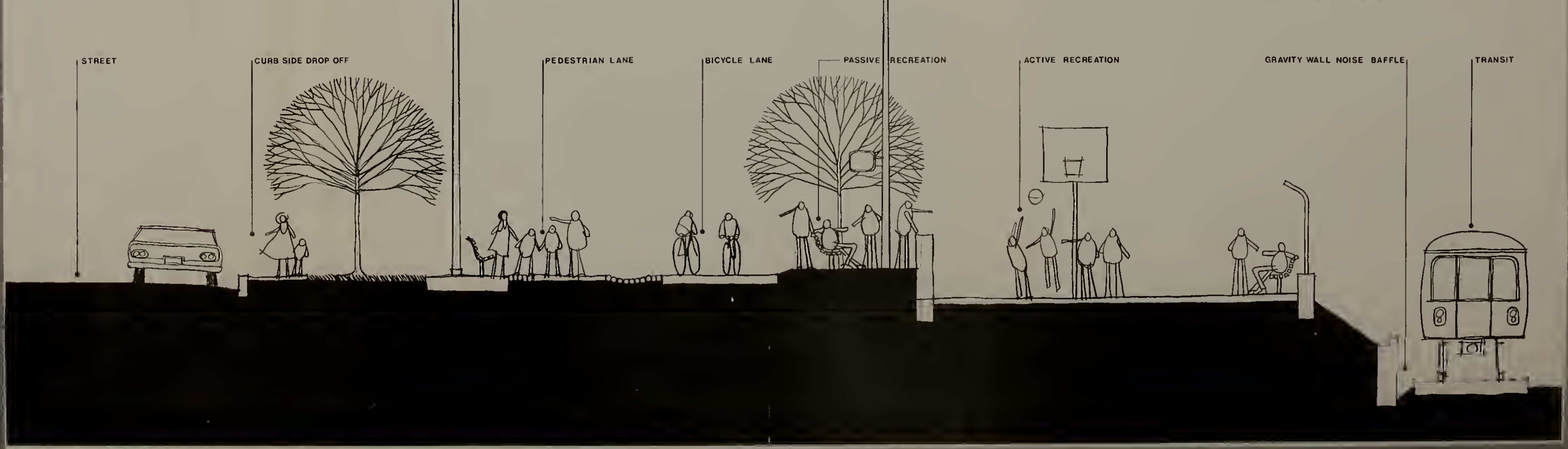


STREET CROSSING



CONTINUOUS GREEN SPACE

ILLUSTRATIVE TRAILWAY SIGNAGE



FREDERIC R HARRIS INC.

NO SCALE

FIGURE A–16

The Commonwealth of Massachusetts

Metropolitan District Commission

20 Somerset Street, Boston 02108

John F. Snedeker
Commissioner

September 30, 1976

Mr. Warren Higgins
Director of Construction
Mass. Bay Transportation Authority
500 Jamaicaway
Jamaica Plain, Massachusetts

Dear Mr. Higgins:

In response to your request for statements of signficance of certain lands of the Metropolitan District Commission as they relate to section 4(f) of the Department of Transportation Act of 1966, the parkway and adjacent park land known as the Arborway, through Forest Hills to the junction of Forest Hills Street and Morton Street is owned and operated by the Commission under the provisions of Chapter 92, Section 3. This section of parkway is part of the linear park system designed by Frederick Law Olmsted and has since 1971 been listed on the National Register.

The segment of parkway that passes through Forest Hills has been altered by construction over the past fifty years most notably by the construction of the parkway overpass. The old linear system of foot paths and bridle paths has been reduced to city sidewalk scale.

In any reconstruction of the Forest Hills area every effort should be made to restore and strengthen the linear park concepts. As stated in the National Register application..."Olmsted established a hierarchy of uses for areas within the system, creating large and medium sized parks for rural relaxation and picnicking smaller landscaped areas with ponds for recreation and linear park land for pleasure driving, riding and hiking." It is the combination of concepts, - hierarchy and linearity - that makes Olmsted's work unique.

The Commission believes that, within the constraints stated above the proposed transportation improvements can be designed to help to re-establish a green corridor through Forest Hills.

Sincerely yours,

JOHN F. SNEDEKER
Commissioner

JBOB/S

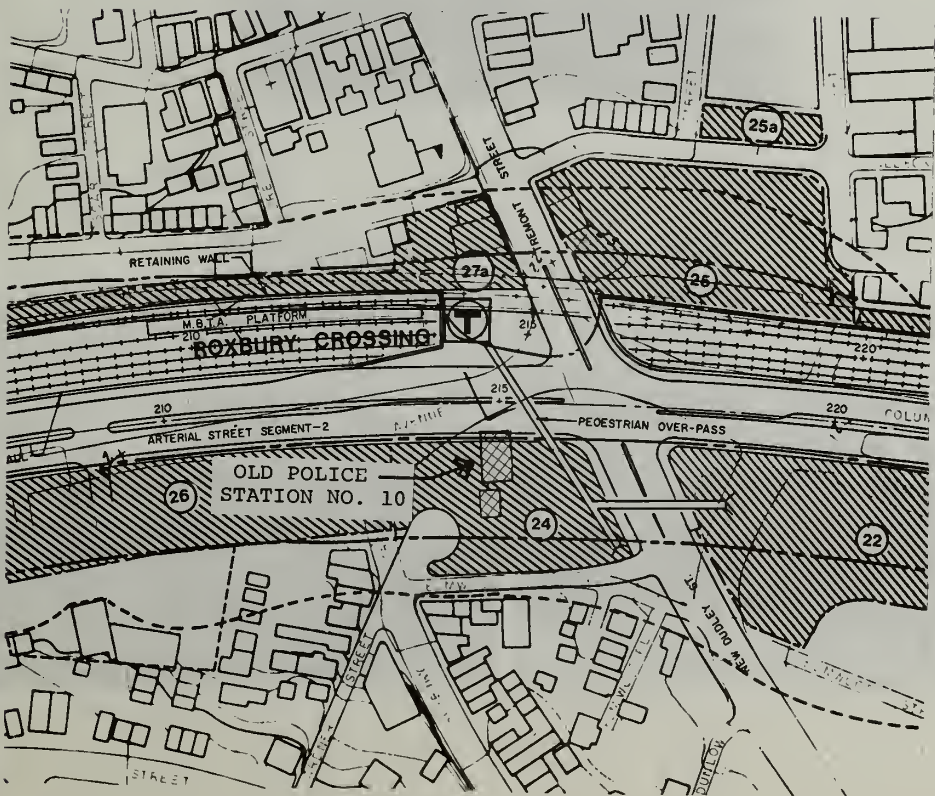
(FIG. A-17)

(FIG. A-18)

OLD POLICE STATION NO. 10

(FIG. A-19)

LOCATION OF OLD POLICE STATION NO. 10



(FIG. A-20)

FOREST HILLS STATION

(FIG. A-21)

ELEVATED STRUCTURE JUST NORTH

OF FOREST HILLS

(FIG. A-22)

GREEN ST. STATION

(FIG. A-23)

EGLESTON STATION

(FIG. A-24)

DUDLEY STATION

(FIG. A-25)

NORTHAMPTON STATION

(FIG. A-26)

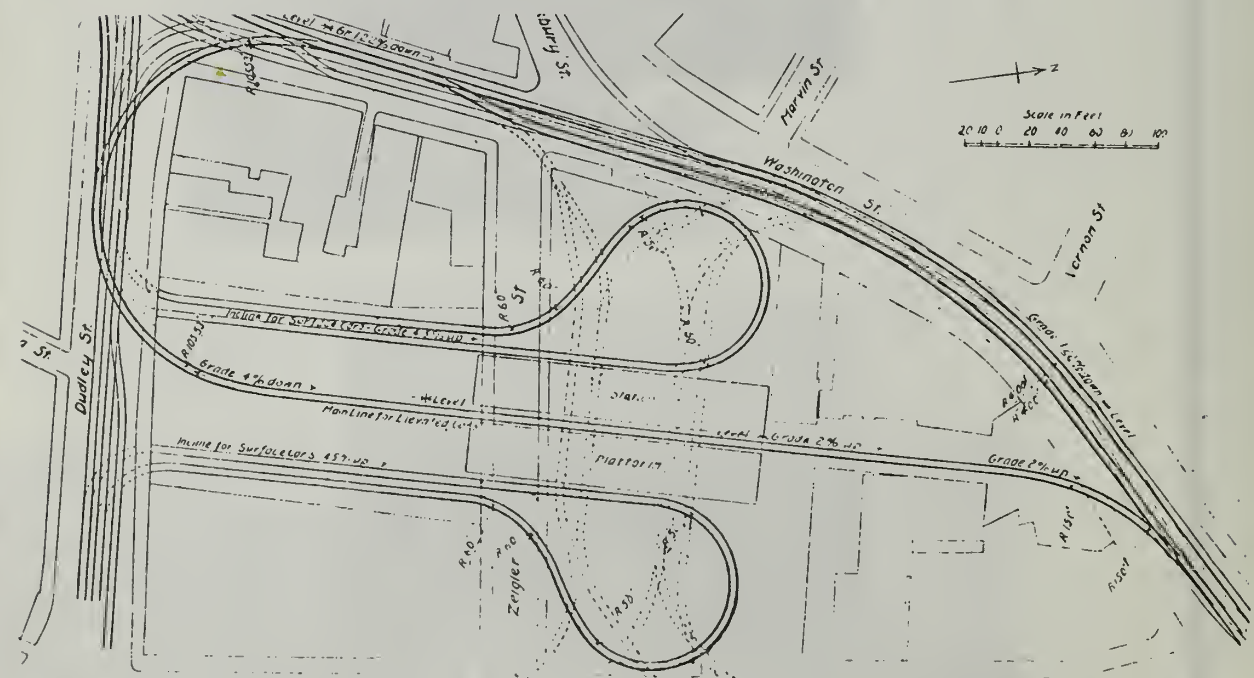
DOVER STATION

(FIG. A-27)

SIDE AND END VIEW OF TYPICAL ELEVATED STATION

(FIG. A-28)

PLAN OF DUDLEY STATION

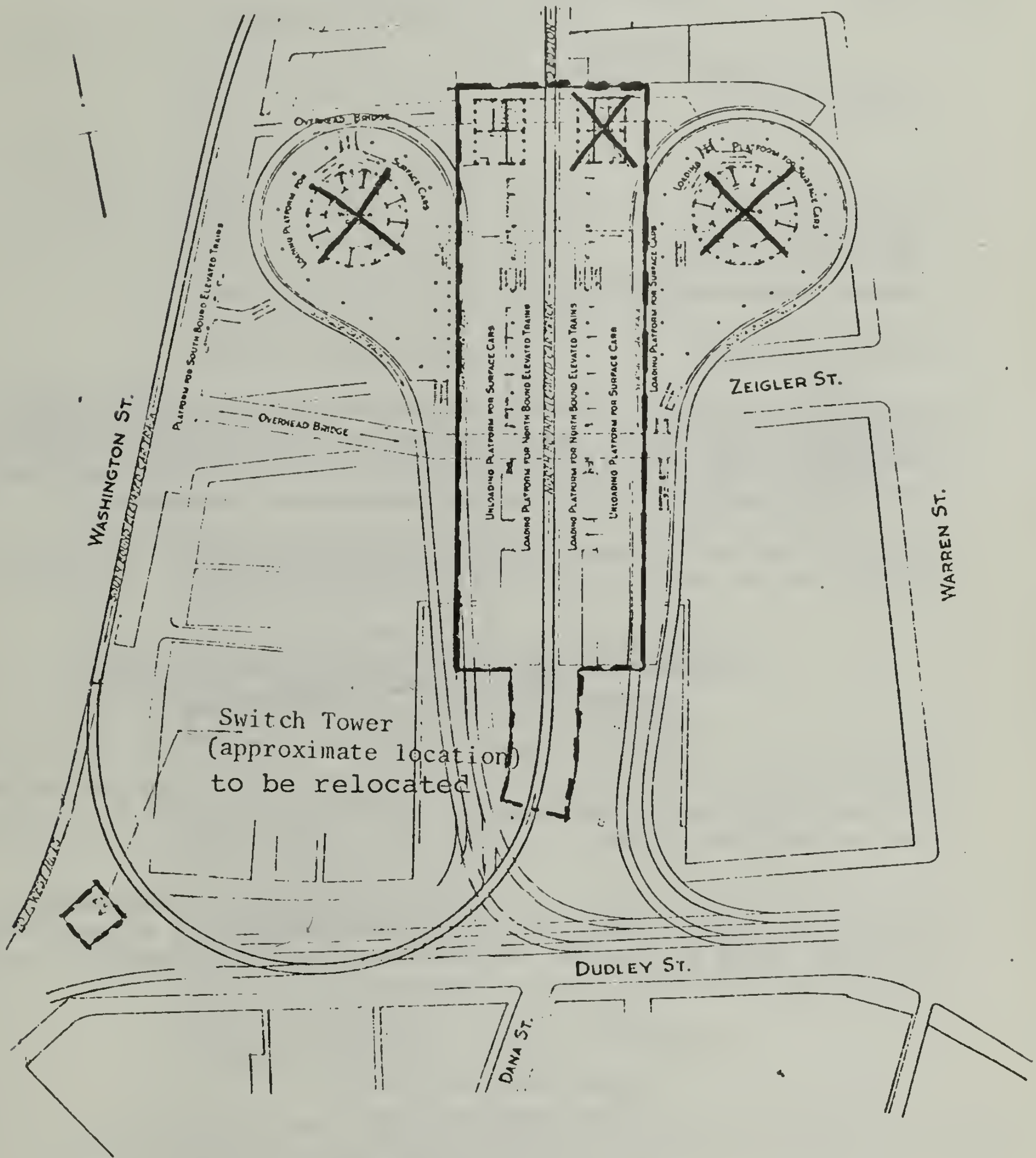


(FIG. A-29)

SECTIONS OF DUDLEY STATION WHICH ARE NOT TO BE

DEMOLISHED AS PART OF SOUTHWEST CORRIDOR PROJECT

Areas enclosed in dash lines may be retained as part of a proposed Dudley Station National Register District. Areas crossed out may have been part of the original 1901-9 construction but have since been demolished.



PAUL GUZZI

Secretary of the Commonwealth

The Commonwealth of Massachusetts

Office of the Secretary

Massachusetts Historical Commission

294 Washington Street Boston, Massachusetts 02108

(617) 727-8470

RECEIVED

AUG 31 1977

August 17, 1977

Mr. Anthony Pangaro, Director
Southwest Corridor
131 Claredon Street
Boston, Massachusetts 02116

Dear Mr. Pangaro:

As State Historic Preservation Officer for Massachusetts, I would like to formally express my opinion on the potential impacts of the Southwest Corridor project on historic properties. The determinations have been made in consultation with the Boston Landmarks Commission.

We feel that the following properties do not meet the criteria for listing in the National Register of Historic Places:

Back Bay Station
Elevated Orange Line south of Dudley Station, including Egleston, Green and Forest Hills Station

Although these properties will be adversely affected by the project, Section 106 Review is not required if the properties are not eligible for the National Register.

Our review of the proposed undertaking has included consideration of properties already listed in the National Register of Historic Places and those which we consider eligible for inclusion. National Register properties included in the review are:

South End Historic District:

- Morgan Memorial Building
- 90-92 Berkeley Street
- 18, 20 Charles Street
- 18, 20, 22, 24, 26, and 28 Cazenove Street
- 254, 264 Columbus Avenue
- 389, 390 Massachusetts Avenue
- Cathedral of the Holy Cross

Youth's Companion Building

Olmsted Park System:

Forest Hills Parkland
Forest Hills Viaduct

Eliot Burying Ground

Properties and districts which have been considered because we feel they may be eligible for the National Register:

Cahners Building (Columbus Avenue)
Salvation Army Building (Berkeley Street)
Bay Village Area
St. Botolph Street Area
Old Police Station #10
Roxbury Highlands Area
Dudley Mansion
Amory Street Workers Housing
Jamaica Plain Neighborhood House
Chestnut and Lamartine Streets Area
Elevated Orange Line north of Dudley Station and including Dudley Station

Consultation and review of the project have led us to the following understanding of the project's impacts on the above properties:

We anticipate no effect on the following properties:

Youth's Companion Building
Cahners Building
Salvation Army Building
Bay Village Area
Roxbury Highlands Area (new construction)
Amory Street Workers Housing
Jamaica Plain Neighborhood House
Chestnut and Lamartine Streets Area

It appears that there will be no adverse effect for:

Morgan Memorial Building
90-92 Berkeley Street
254 Columbus Avenue
St. Botolph Street Area
Dudley Mansion
Forest Hills Parkland
Roxbury Highlands Area (ell removal)
Eliot Burying Ground
Cathedral of the Holy Cross

It is agreed that the undertaking will adversely effect the historic and architectural integrity of:

18-20 Charles Street
18, 20, 22, 24, 26 and 28 Cazenove Street
264 Columbus Avenue
389, 390 Massachusetts Avenue

August 17, 1977
Mr. Pangaro

Police Station #10
Forest Hills Viaduct
Elevated Orange Line north of Dudley Station
and Dudley Station

We understand that the Urban Massachusetts Transportation Administration will seek determinations of eligibility from the Secretary of the Interior in accordance with 36 CFR 800.4 for all properties which we have agreed appear to be eligible for the National Register and on which there will be an effect, beneficial or adverse.

Sincerely yours,

Elizabeth Reed Amadon

Elizabeth Reed Amadon
Executive Director
Massachusetts Historical Commission
State Historic Preservation Officer

Marcia Myers
Director, Boston Landmarks Commission

The Commonwealth of Massachusetts
Office of the Secretary
Massachusetts Historical Commission

PAUL GUZZI
Secretary of the Commonwealth

294 Washington Street Boston, Massachusetts 02108
(617) 727-8470

October 28, 1977

Mr. Peter Calcaterra
Southwest Corridor, MBTA
131 Clarendon Street
Boston, MA

Dear Mr. Calterra:

The Massachusetts Historical Commission wishes to correct a mistake made in our original comments on the effects of the Southwest Corridor project on historic properties.

Our letter of August 17, 1977 to your office should be amended to read:

p.1.,line 28: change "254,264 Columbus Avenue" to "254,256,258,260,262 Columbus Avenue".

p.2.,line 36: change "254" to"262".

p.2.,line 47: change "264" to "254,256,258,260".

We feel that the property at 262 Columbus Avenue will not be adversely affected and that the properties at 254, 256, 258, and 260 Columbus Avenue will be adversely affected by the project.

We apologize to you for the confusion this may have caused.

We have determined that the Cutter School is not within a historic district and is not eligible for the National Register as it is only a few years old.

Sincerely yours,

Elizabeth Reed Amadon

Elizabeth Reed Amadon
Executive Director, MHC

ERA/MBW/

(Fig. A-30, page 4 of 4)

The Commonwealth of Massachusetts
Office of the Secretary
Massachusetts Historical Commission
294 Washington Street Boston, Massachusetts 02108
(617) 727-8470

COPY

Secretary of the Commonwealth

February 16, 1977

Mr. Peter Calcaterra
Assistant Project Manager
Southwest Corridor Development
500 Arborway
Boston, Massachusetts 02130

Re: Southwest Corridor Environmental Impact Statement

Dear Mr. Calcaterra:

I have reviewed Appendix A and Section 2.2.2.6 of the above mentioned Environmental Impact Statement.

Although it is clearly unfortunate that the project will have an adverse effect on several National Register properties, the EIS has illustrated that there is no prudent and feasible alternative to the course of action selected. It is my opinion that the measures outlined in this document satisfactorily mitigate the adversity of the undertaking.

We expect that UMTA will be submitting the Preliminary Case Report to the Advisory Council on Historic Preservation shortly so that the consultation process can proceed and a Memorandum of Agreement be prepared. Thank you for your continuing cooperation in attempting to minimize the effects of this project on significant historic resources.

Sincerely yours,

Elizabeth Reed Amadon

Elizabeth Reed Amadon
Executive Director
Massachusetts Historical Commission
State Historic Preservation Officer

ERA/MBW/mbw

xc: Ki Mano

The Commonwealth of Massachusetts
Office of the Secretary
Massachusetts Historical Commission
PAUL GUZZI
Secretary of the Commonwealth
294 Washington Street Boston, Massachusetts 02108
(617) 727-8470

April 4, 1977

RECEIVED
APR 1 4 1984
UTA-30

Mr. Peter Benjamin
Director, Office of Program Analysis
Urban Mass Transportation Administration
Department of Transportation
Washington, D.C. 20590

Re: Draft EIS - Orange Line
Boston, Massachusetts
MA-23-9007

Dear Mr. Benjamin:

As State Historic Preservation Officer, I have reviewed the Draft EIS for the above project with particular regard to Appendix A.5, Section 4(f) and Section 106 Properties. Our office has concurred that there is no prudent and feasible course of action other than the proposed one, and that all necessary steps have been taken to mitigate adverse effects to historic and cultural resources in the project impact area.

A copy of my February 16, 1977 letter to Mr. Peter Calcatterra reiterates this opinion and is enclosed for your information. As consultation with the Advisory Council on Historic Preservation proceeds in accordance with 36CFR 800, we will expect to be advised of the Memorandum of Agreement. As you note in the Draft EIS (A.1), this Memorandum should be included in the Final EIS.

The Massachusetts Historical Commission does not expect any effects on significant archeological properties since the relocation and arterial roadway will be located in areas which have been subjected to substantial earth-moving.

We commend the comprehensiveness of the Draft EIS in dealing with cultural resources and maintenance of their integrity to the greatest extent possible.

Sincerely yours,

Elizabeth Reed Amadon

Elizabeth Reed Amadon
Executive Director
Massachusetts Historical Commission
State Historic Preservation Officer

b

APPENDIX

Appendix B

CARBON MONOXIDE CONCENTRATIONS - 1975, 1980 and 2000

Maximum 1-hour concentrations as predicted for all alternatives in the years 1975, 1980 and 2000 are shown in this section for each of seven cross-sections in the Southwest Corridor. Maximum 8-hour concentrations were calculated using an EPA[1] methodology that applies a scaling factor (in this case 0.6) to the 1-hour predictions. This scaling factor represents the combined effects of lower average traffic volumes during the peak 8-hour period compared the the peak 1-hour period, and the persistence of worst-case 1-hour meteorological conditions over an 8-hour period. Since the 1-hour and 8-hour concentrations differ only by a scaling factor, separate graphs were not drawn for each. Instead, two vertical scales were drawn on each graph so that each point can be read as both a maximum 1-hour concentration (left-hand scale) and a maximum 8-hour concentration (right-hand scale).

A complete description of the project alternatives is given in Section 4.4.

Note that the estimated completion date for any of the Build alternatives is 1980. Therefore, predicted concentrations for the Build alternatives in 1975 do not refer to a real situation, but rather are presented only for relative comparison with the No-Build condition.

The carbon monoxide concentrations associated with Post-Hearing Alternatives PHP-1 and PHP-2 are the same as these given for Alternatives FH-6 and FH-5 respectively.

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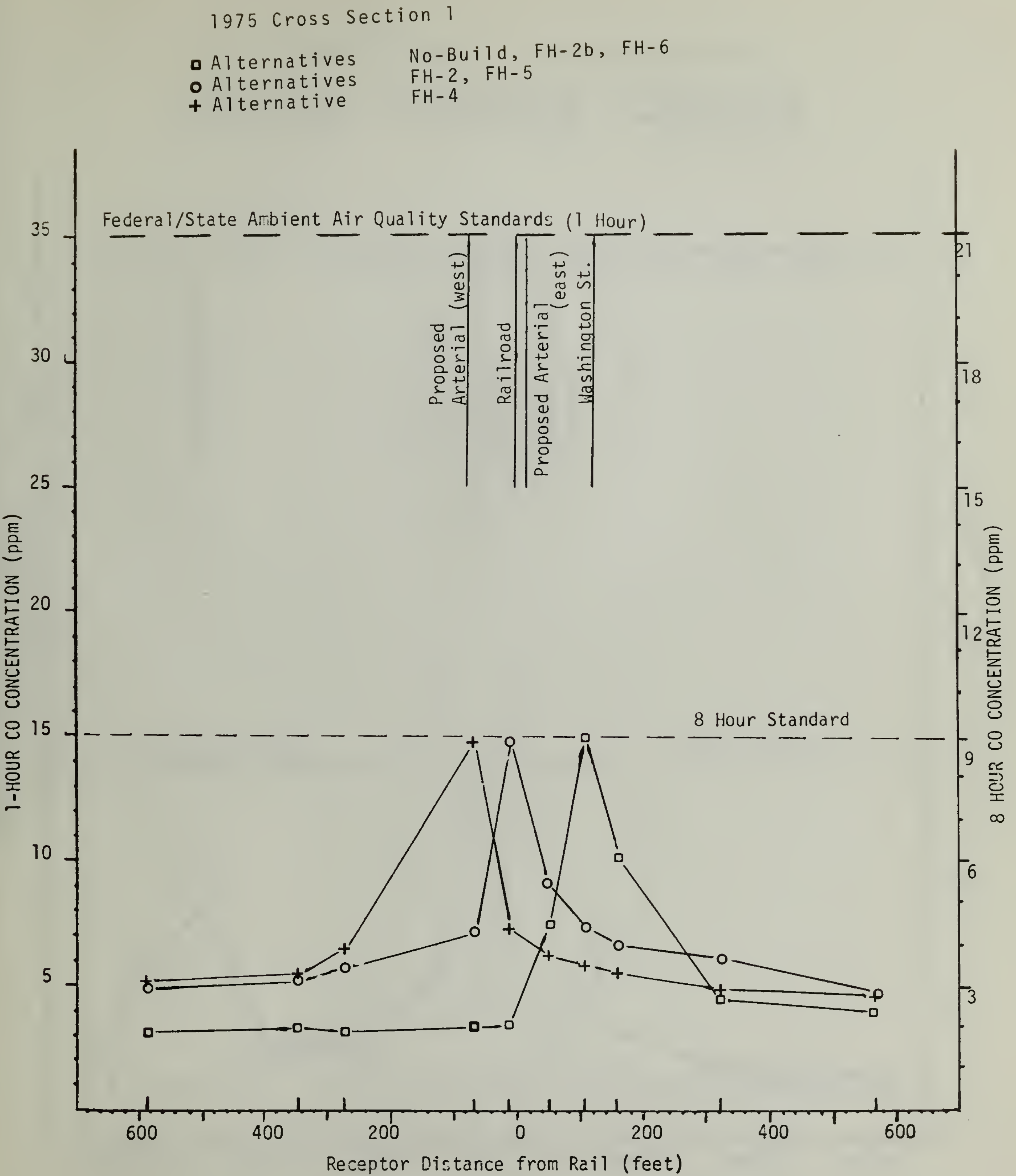
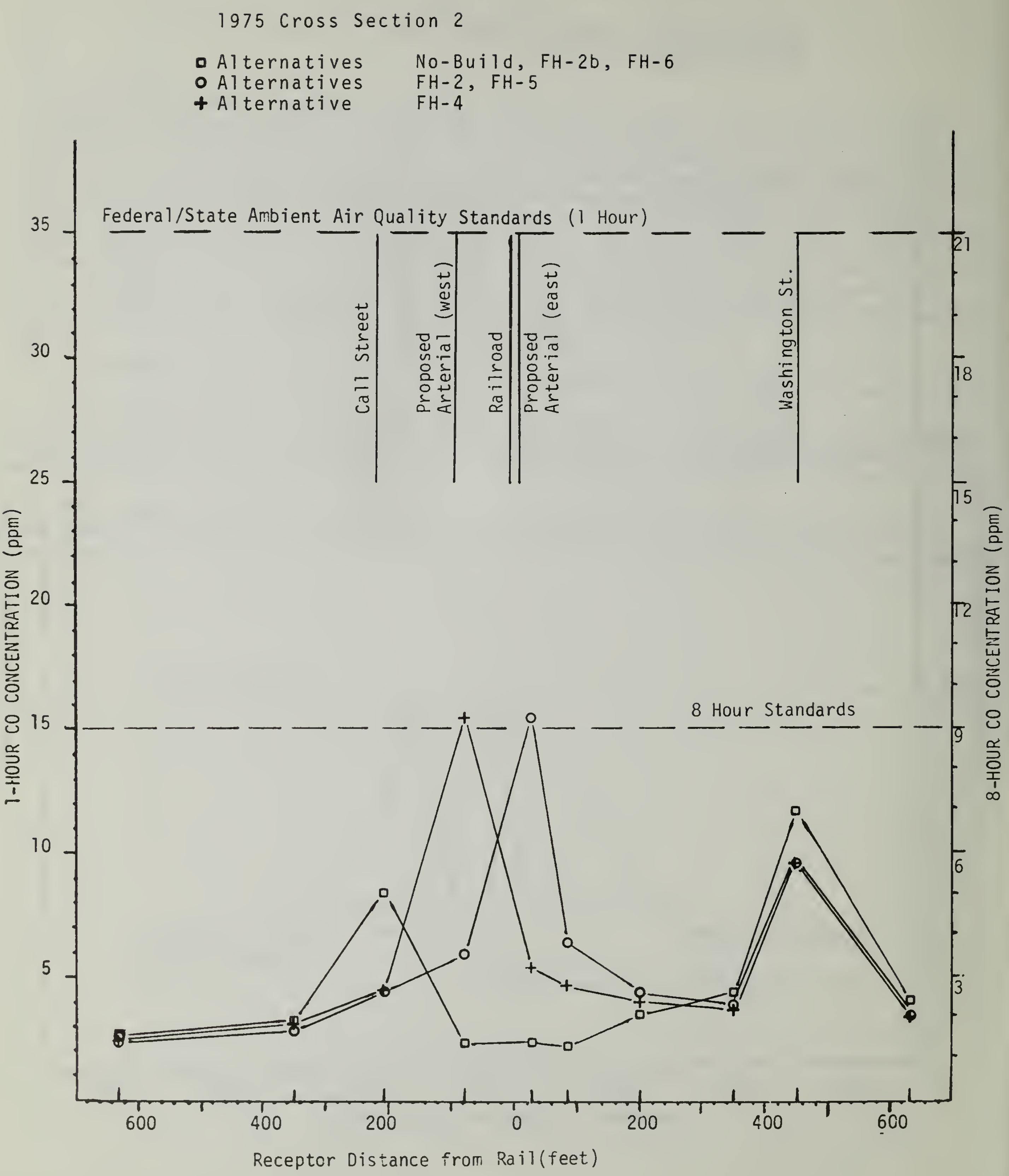
[1]Guidelines for Air Quality Planning and Analysis, Volume 9
EPA-450/4-75-001, U.S. Environmental Protection Agency, Washington, D.C.



1975 Cross Section 1
Alternatives No-Build, FH-2b, FH-6
Alternatives FH-2, FH-5
Alternative FH-4
Federal/State Ambient Air Quality Standards (1 Hour)
Proposed Arterial (west)
Railroad
Proposed Arterial (east)
Washington St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8 HOUR CO CONCENTRATION (ppm)
Receptor Distance from Rail (feet)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600

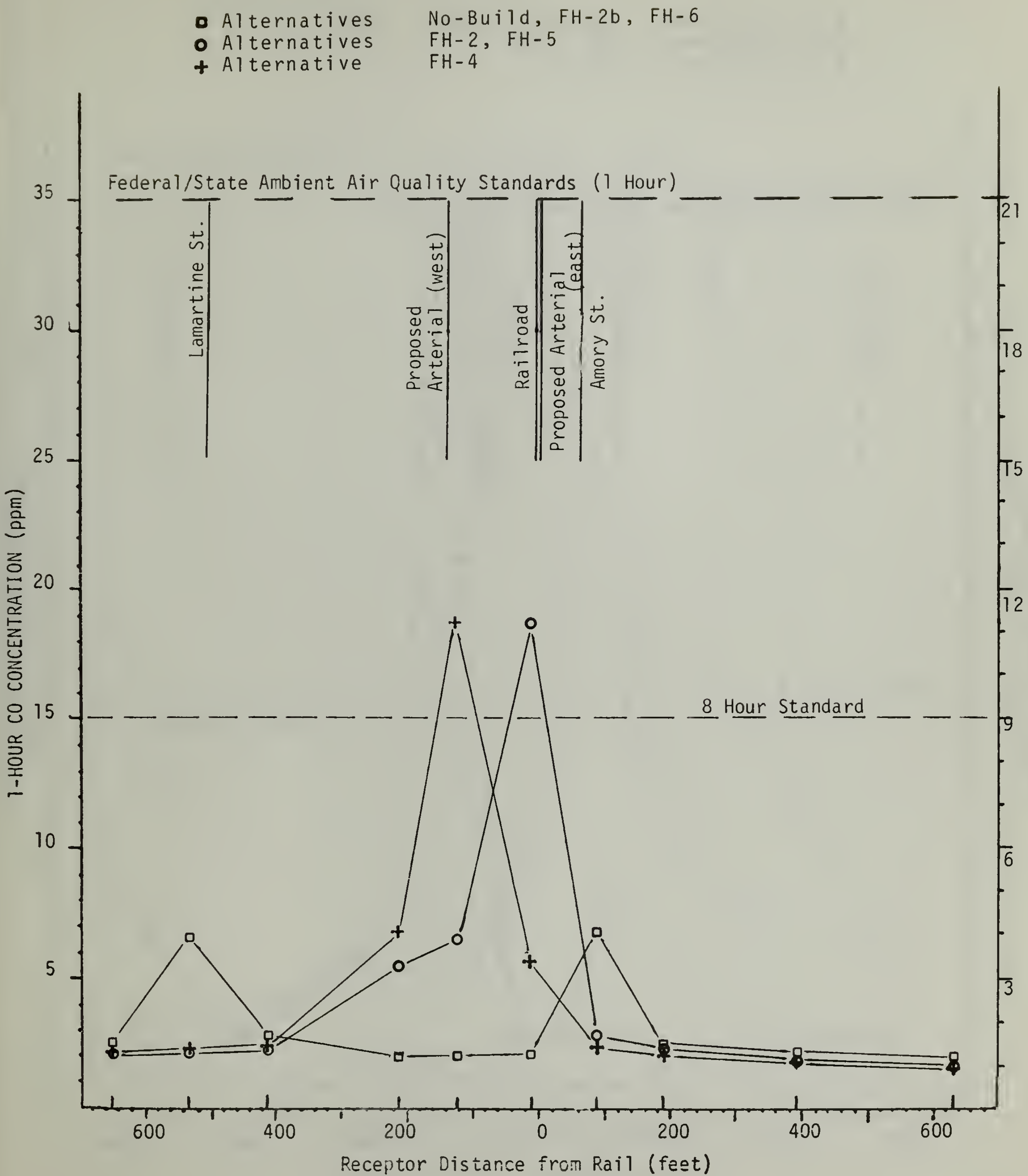
(FIG. B-1)



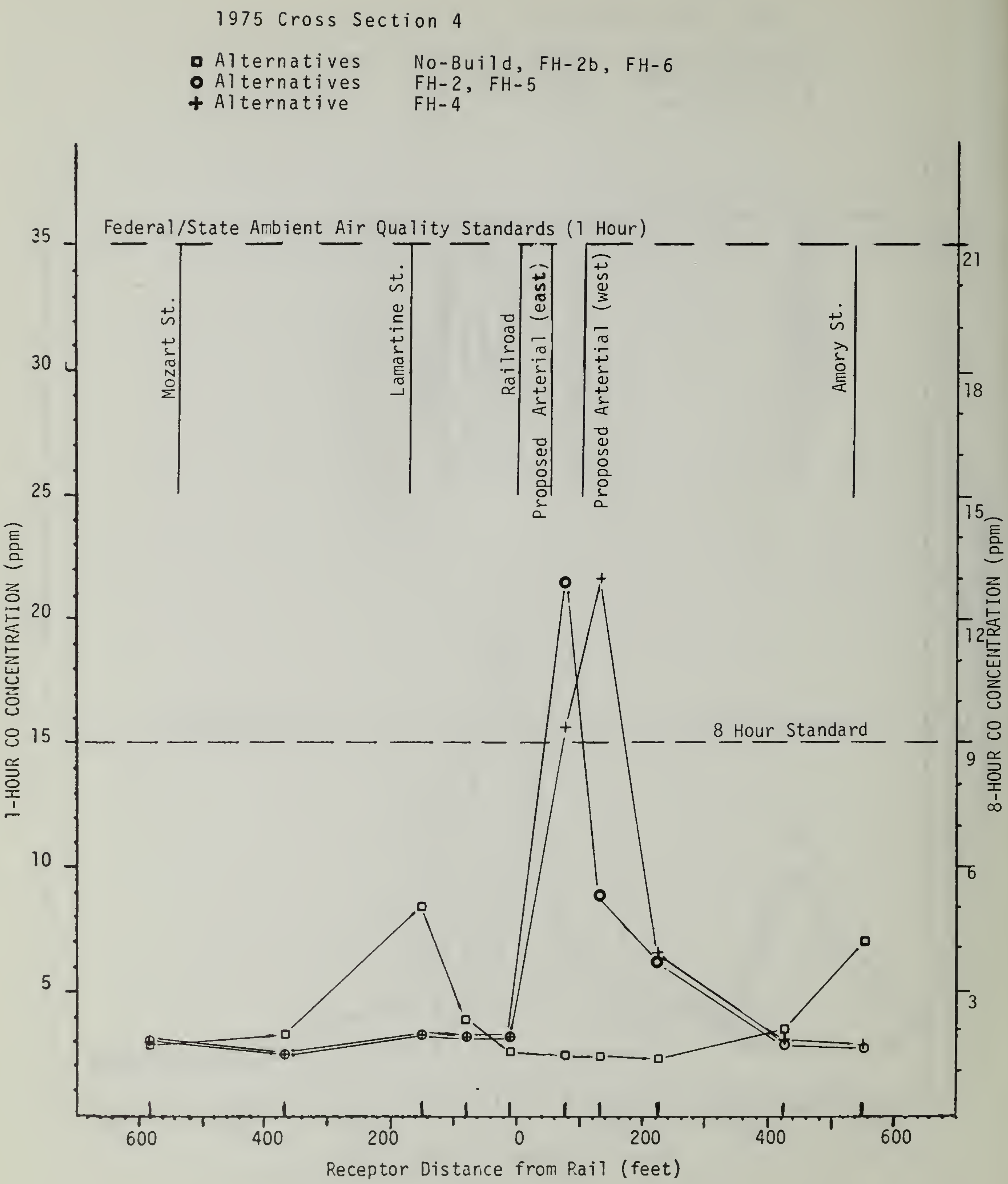
1975 Cross Section 2
Alternatives No-Build, FH-2b, FH-6
Alternatives FH-2, FH-5
Alternative FH-4
Federal/State Ambient Air Quality Standards (1 Hour)
Call Street
Proposed Arterial (west)
Railroad
Proposed Arterial (east)
Washington St.
8 Hour Standards
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail(feet)

(FIG. B-2)

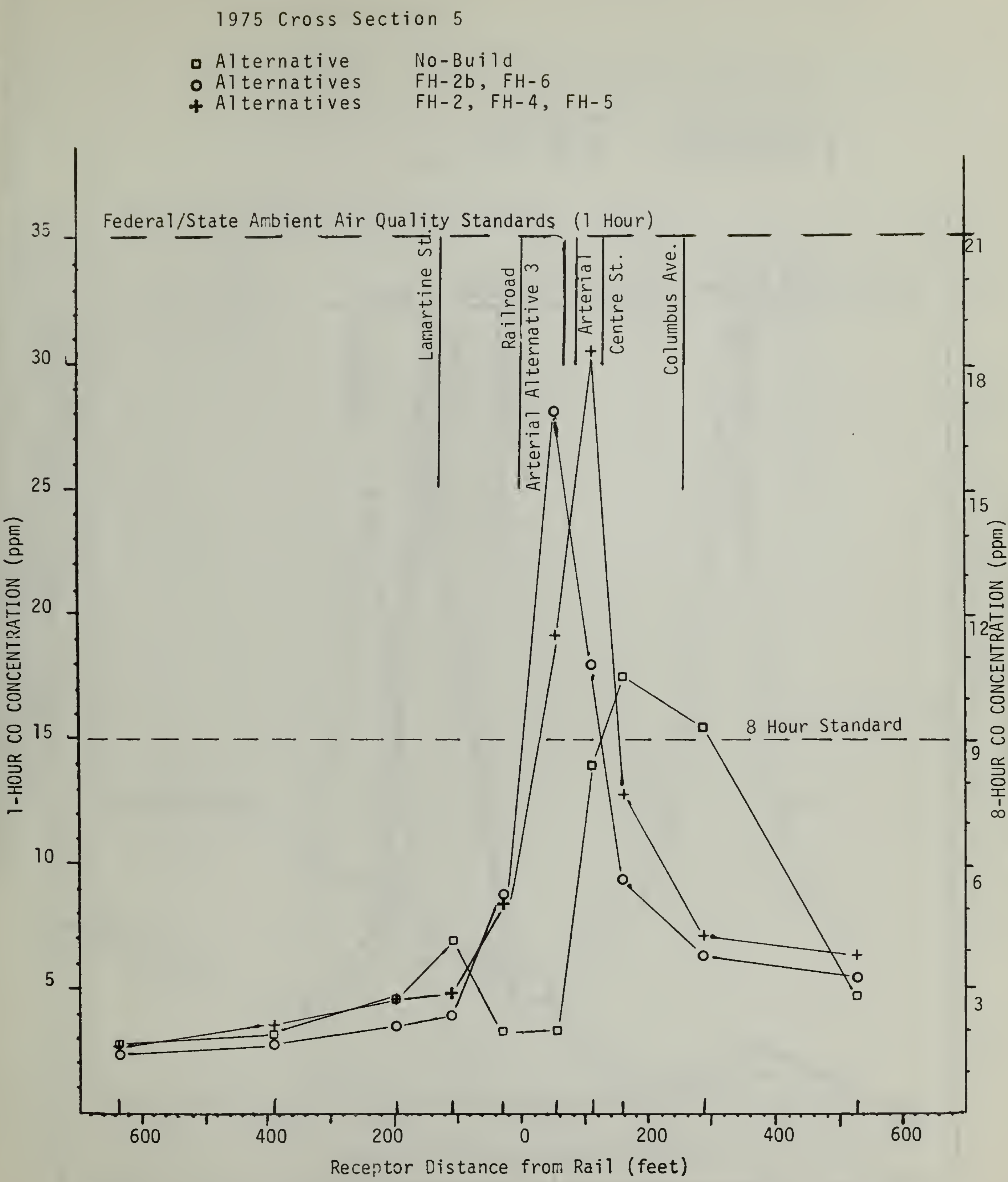
1975 Cross Section 3



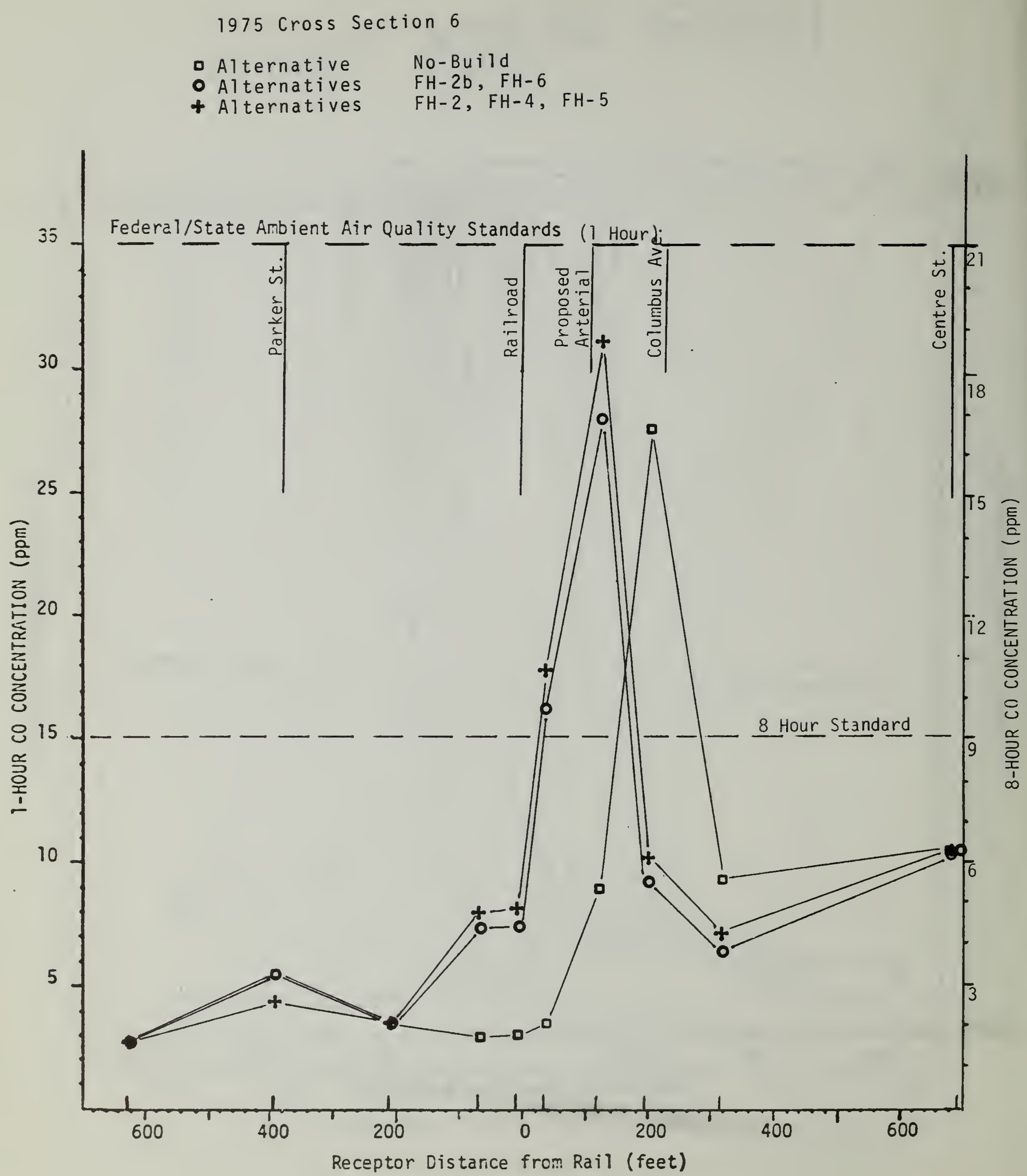
(FIG. B-3)


1975 Cross Section 4
Alternatives No-Build, FH-2b, FH-6
Alternatives FH-2, FH-5
Alternative FH-4
Federal/State Ambient Air Quality Standards (1 Hour)
Mozart St.
Lamartine St.
Railroad
Proposed Arterial (east)
Proposed Arterial (west)
Amory St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

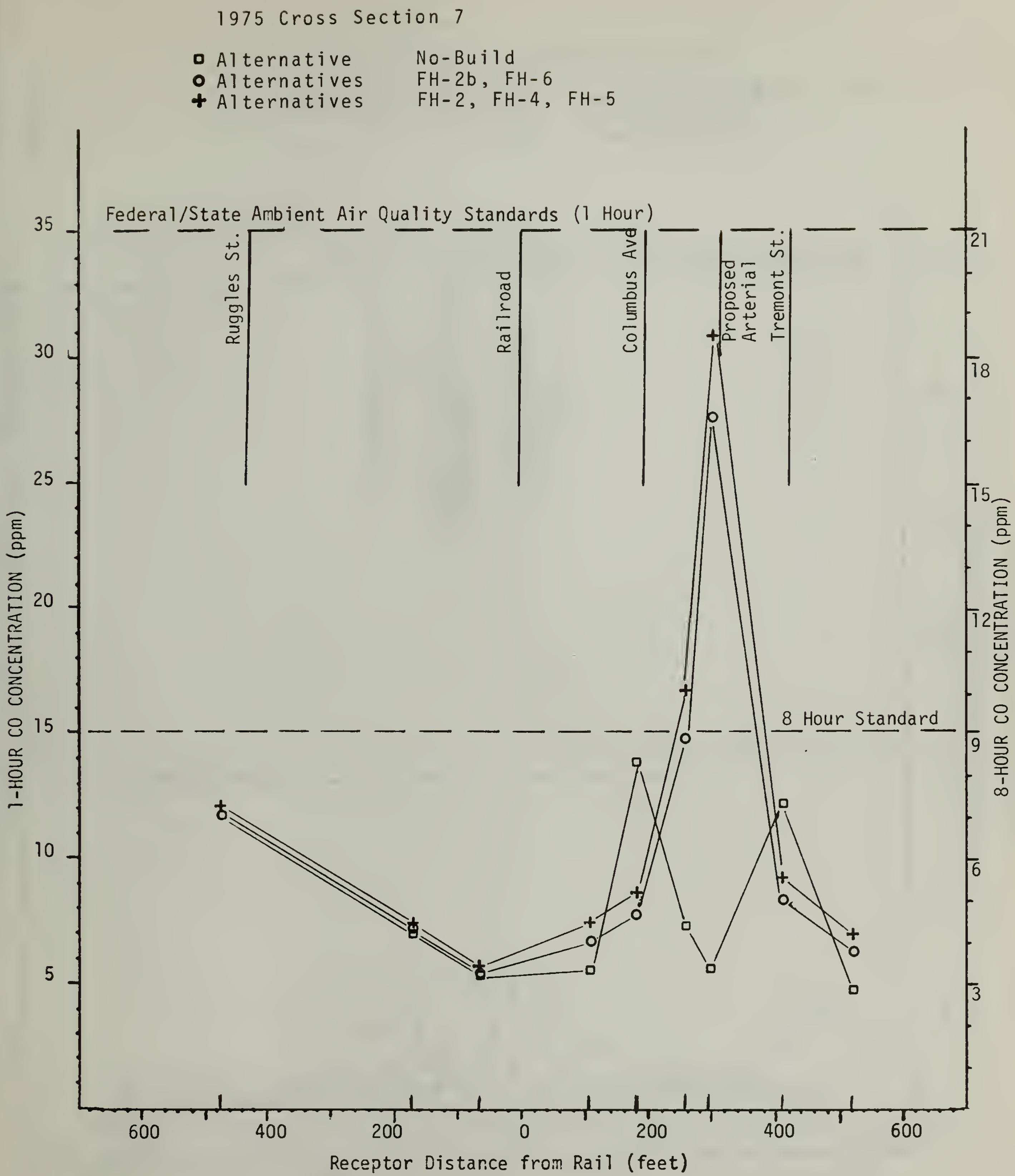
(FIG. B-4)


1975 Cross Section 5
Alternative No-Build
Alternatives FH-2b, FH-6
Alternatives FH-2, FH-4, FH-5
Federal/State Ambient Air Quality Standards (1 Hour)
Lamartine St.
Railroad
Arterial Alternative 3
Arterial
Centre St.
Columbus Ave.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

(FIG. B-5)


1975 Cross Section 6
Alternative No-Build
Alternatives FH-2b, FH-6
Alternatives FH-2, FH-4, FH-5
Federal/State Ambient Air Quality Standards (1 Hour)
Parker St.
Railroad
Proposed Arterial
Columbus Av.
Centre St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

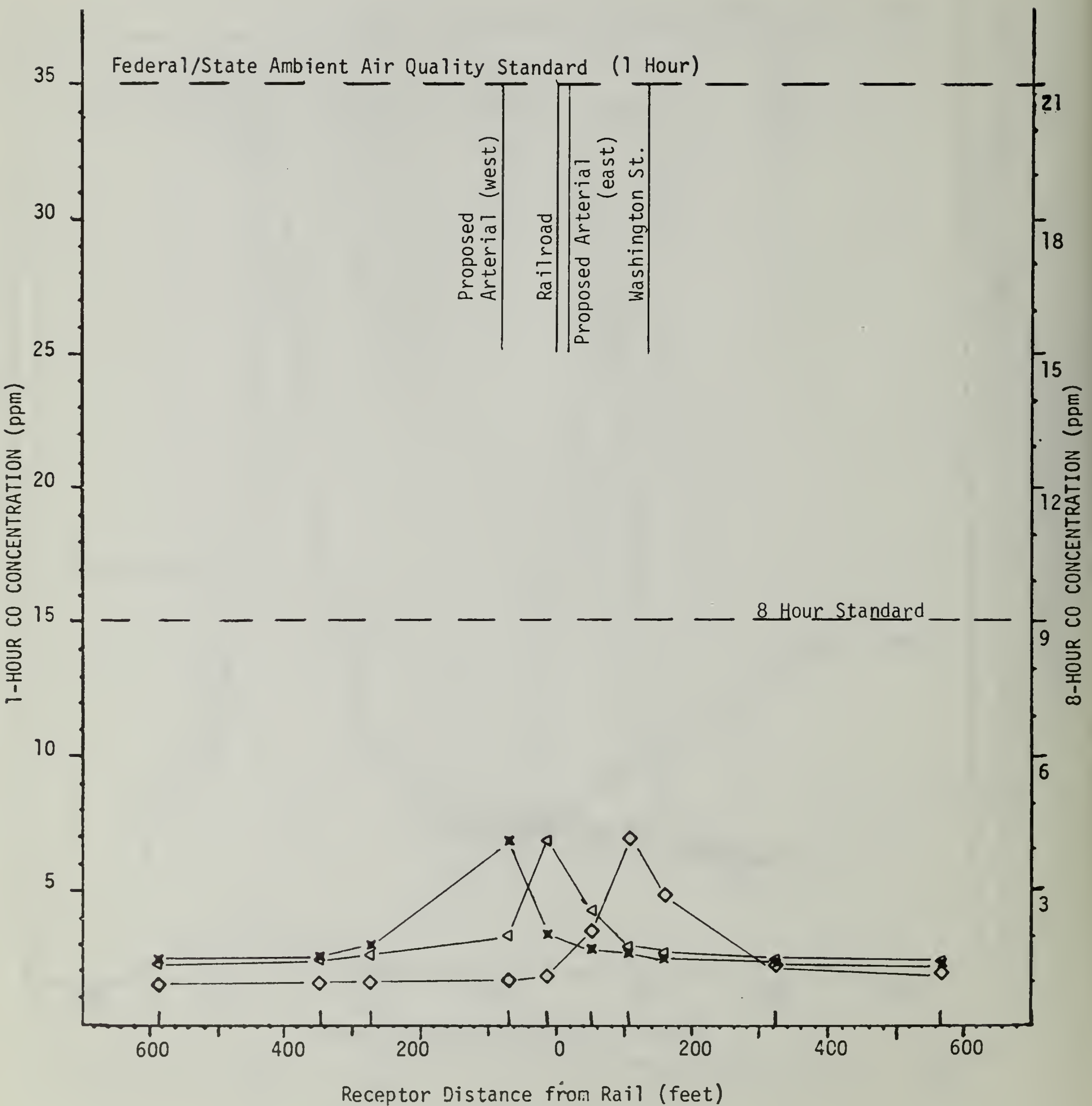
(FIG. B-6)


1975 Cross Section 7
Alternative No-Build
Alternatives FH-2b, FH-6
Alternatives FH-2, FH-4, FH-5
Federal/State Ambient Air Quality Standards (1 Hour)
Ruggles St.
Railroad
Columbus Ave
Proposed Arterial
Tremont St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

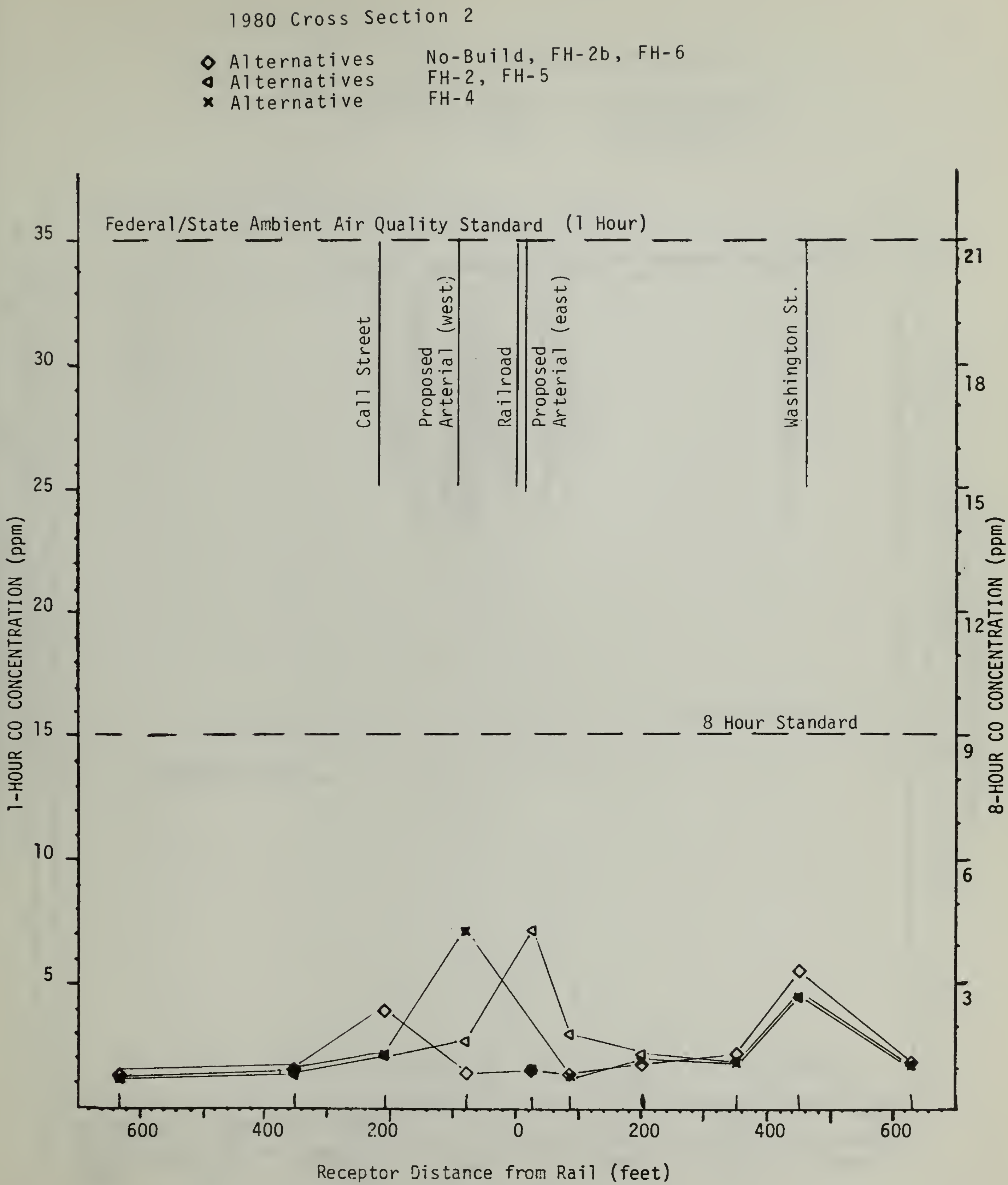
(FIG. B-7)

1980 Cross Section 1

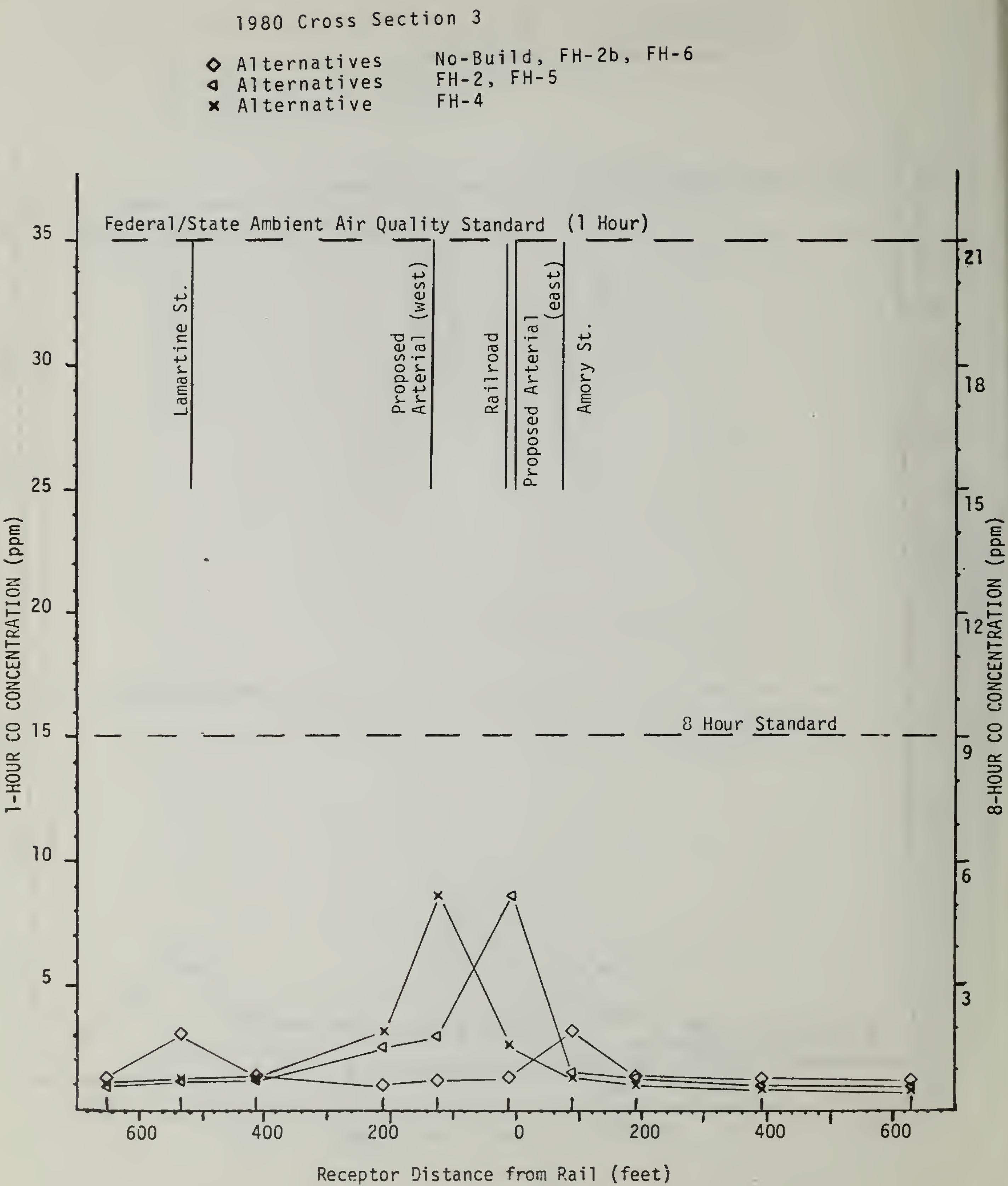
◇ Alternatives No-Build, FH-2b, FH-6
◁ Alternatives FH-2, FH-5
✖ Alternative FH-4



(FIG. B-8)


1980 Cross Section 2
Alternatives No-Build, FH-2b, FH-6
Alternatives FH-2, FH-5
Alternative FH-4
Federal/State Ambient Air Quality Standard (1 Hour)
Call Street
Proposed Arterial (west)
Railroad
Proposed Arterial (east)
Washington St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

(FIG. B-9)

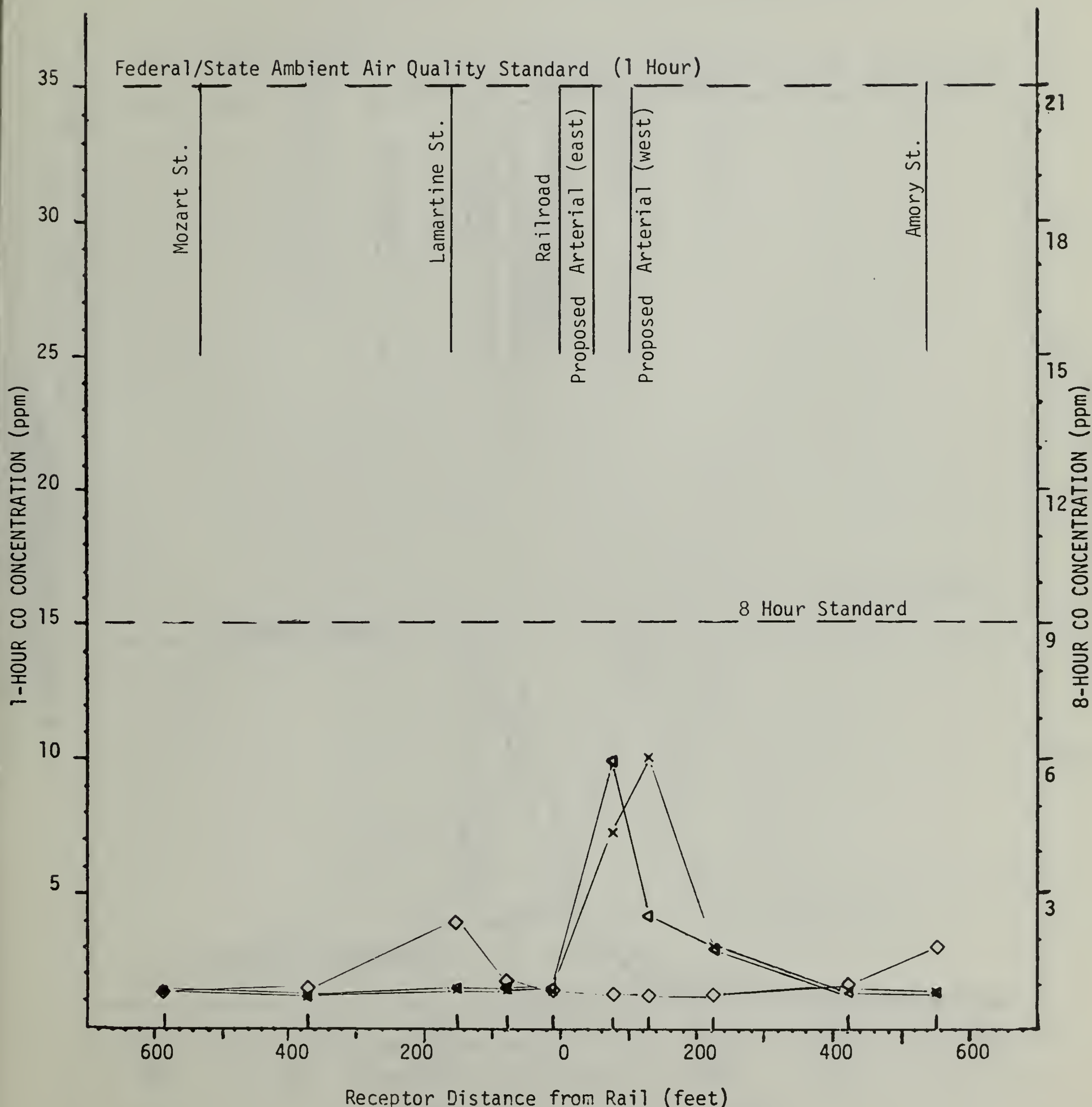


1980 Cross Section 3
◇ Alternatives No-Build, FH-2b, FH-6
◁ Alternatives FH-2, FH-5
× Alternative FH-4
Federal/State Ambient Air Quality Standard (1 Hour)
Lamartine St.
Proposed Arterial (west)
Railroad
Proposed Arterial (east)
Amory St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

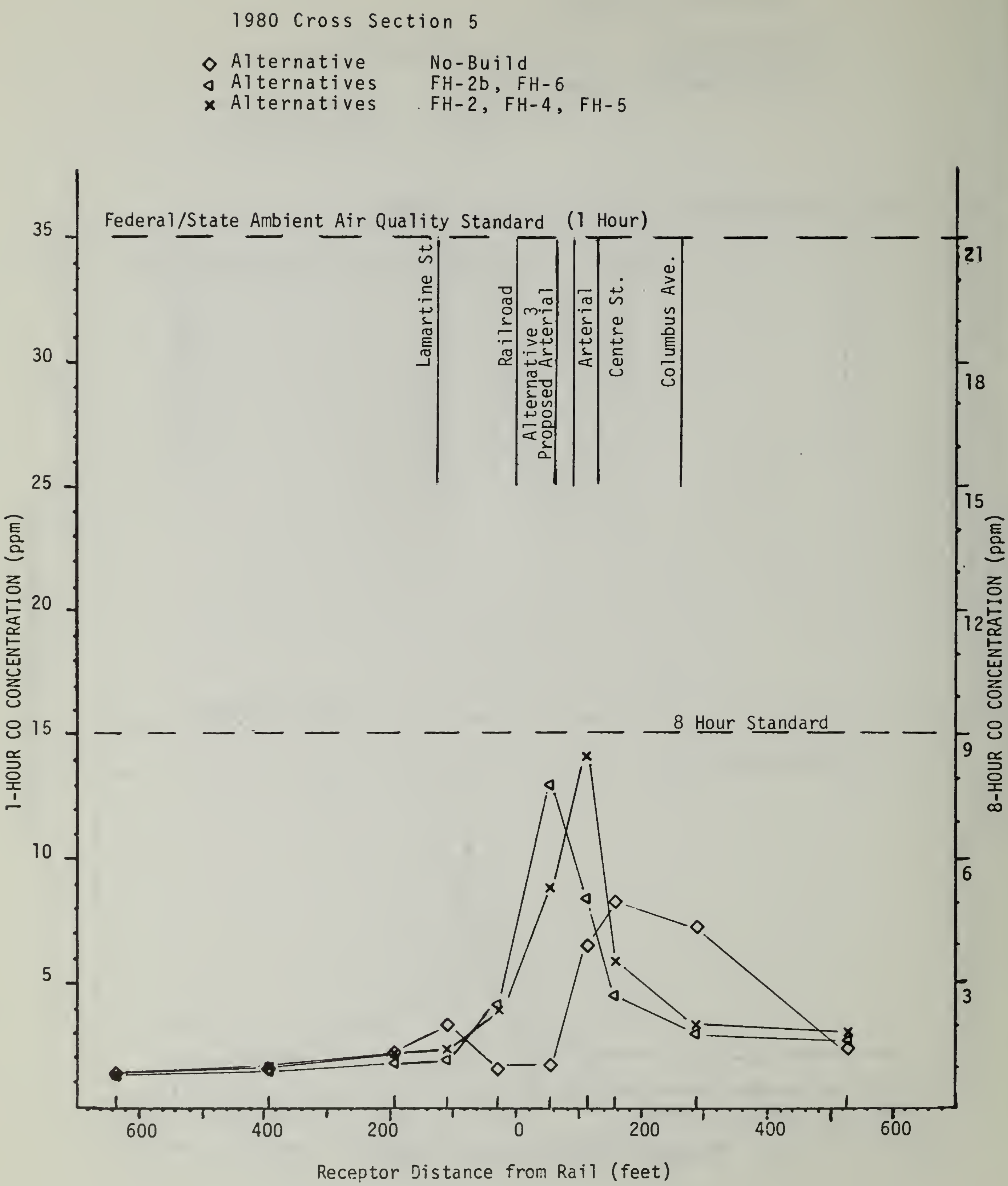
(FIG. B-10)

1980 Cross Section 4

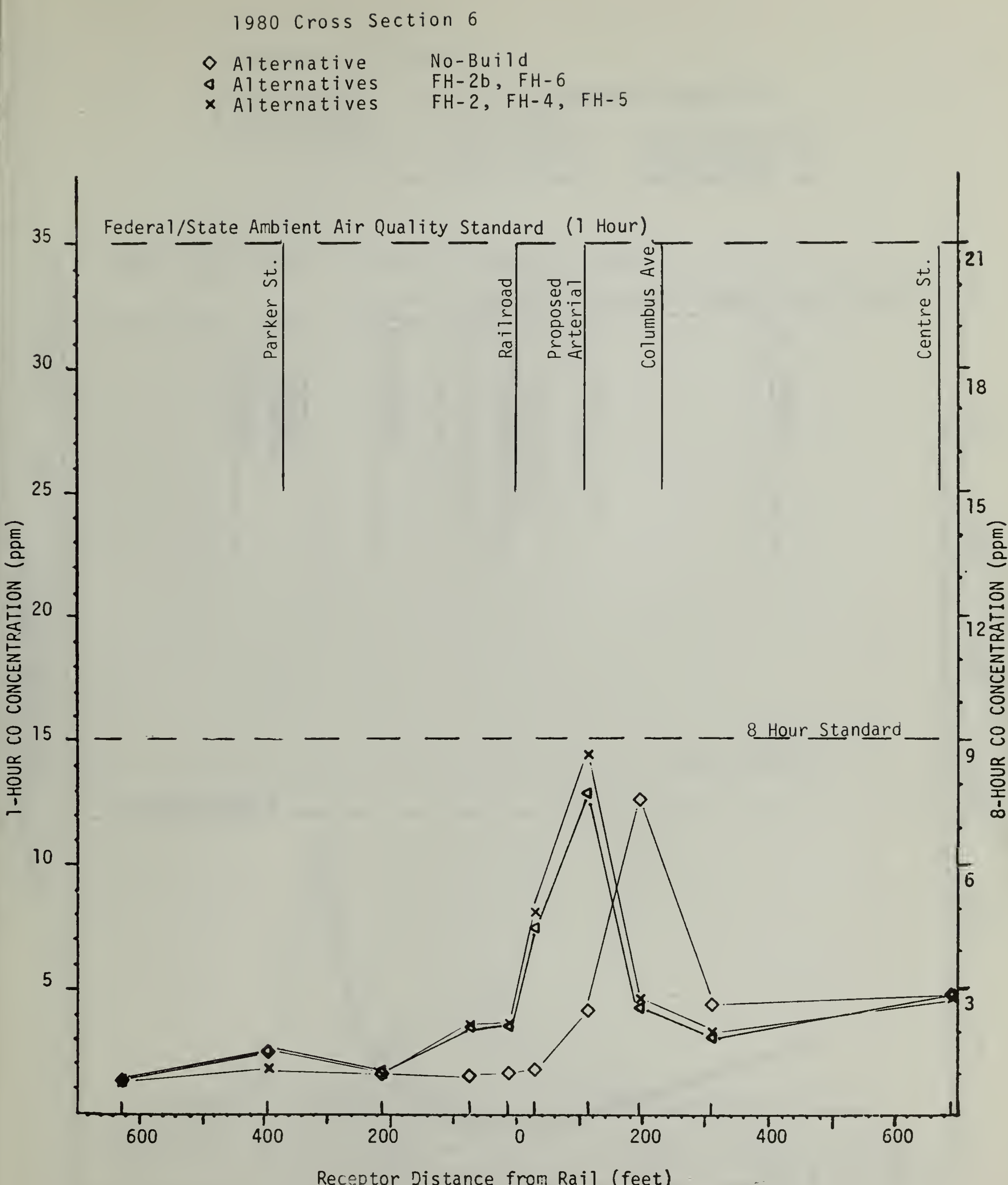
◇ Alternatives No-Build, FH-2b, FH-6
◁ Alternatives FH-2, FH-5
× Alternative FH-4



(FIG. B-11)

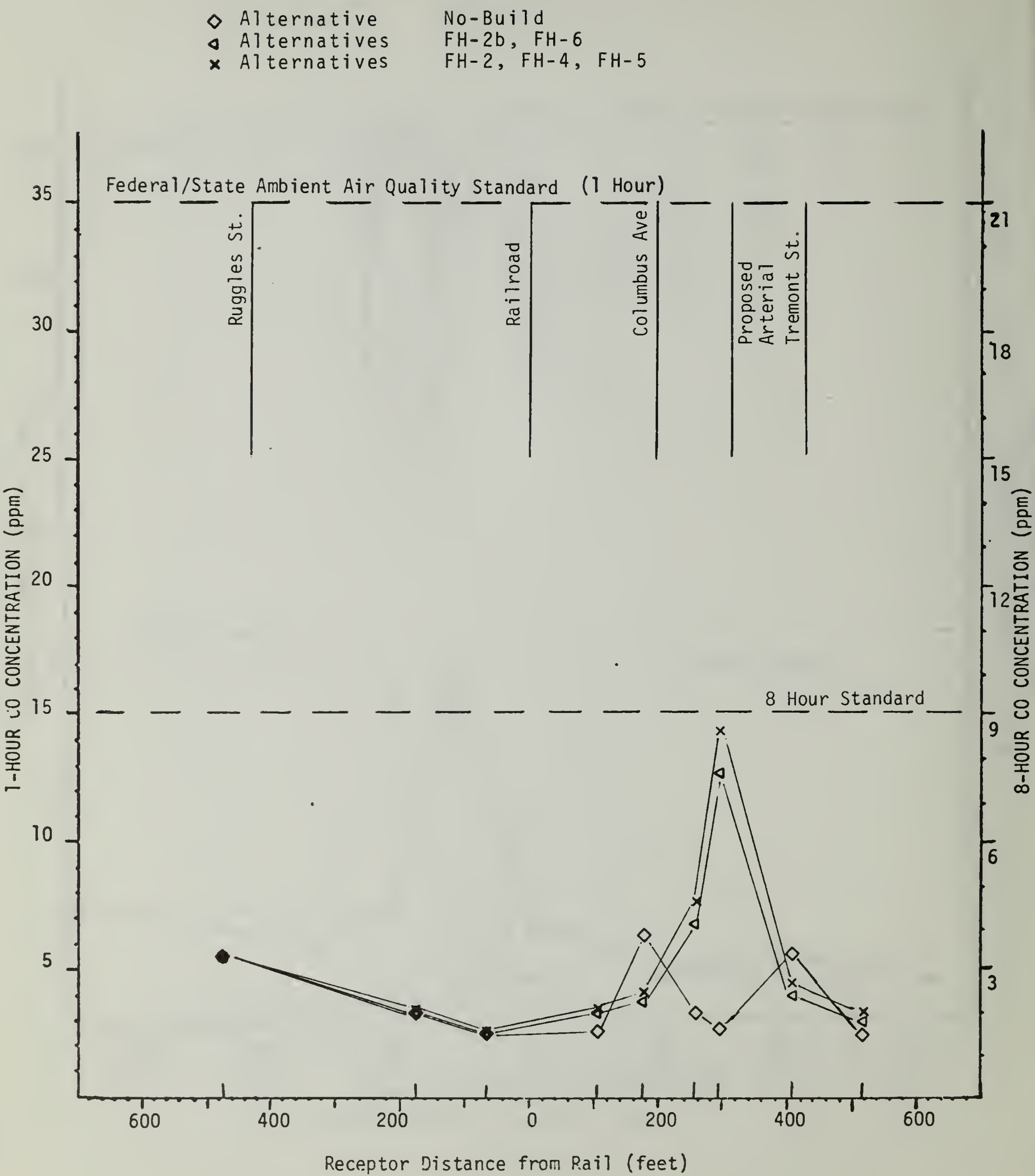

1980 Cross Section 5
Alternative No-Build
Alternatives FH-2b, FH-6
Alternatives FH-2, FH-4, FH-5
Federal/State Ambient Air Quality Standard (1 Hour)
Lamartine St
Railroad
Alternative 3 Proposed Arterial
Arterial
Centre St.
Columbus Ave.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
Receptor Distance from Rail (feet)

(FIG. B-12)


1980 Cross Section 6
◇ Alternative No-Build
◁ Alternatives FH-2b, FH-6
× Alternatives FH-2, FH-4, FH-5
Federal/State Ambient Air Quality Standard (1 Hour)
Parker St.
Railroad
Proposed Arterial
Columbus Ave.
Centre St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

(FIG. B-13)

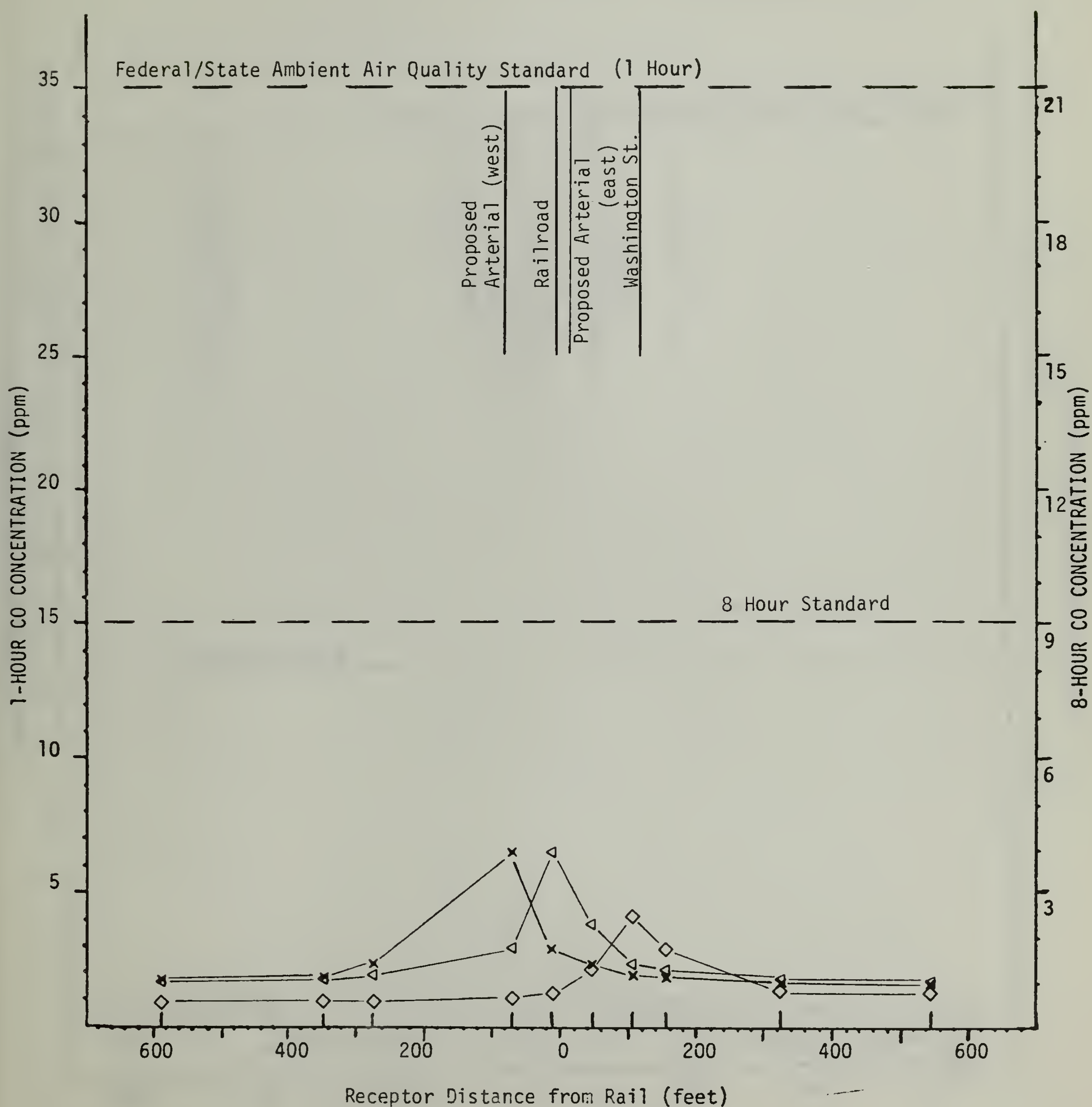
1980 Cross Section 7



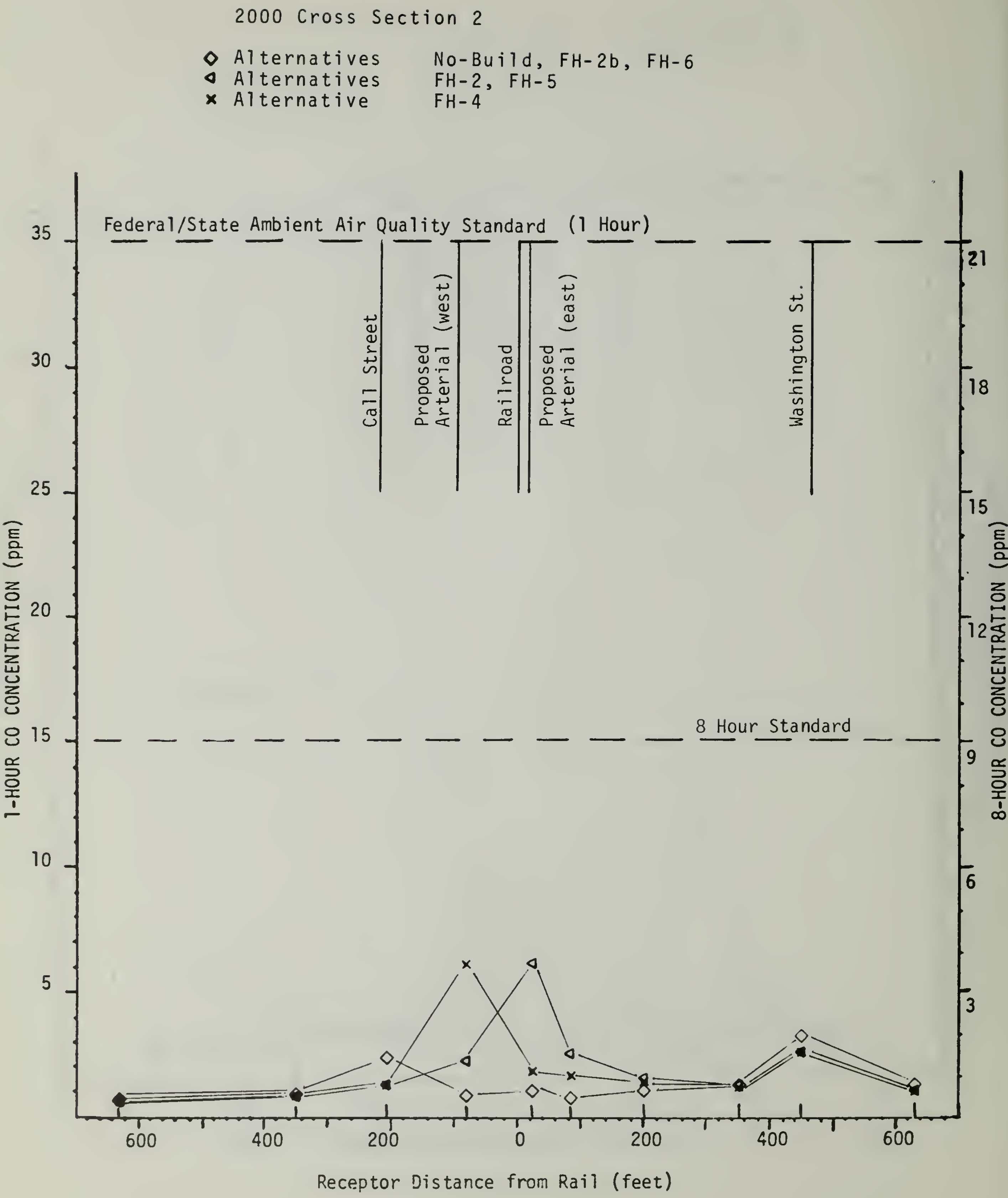
(FIG. B-14)

2000 Cross Section 1

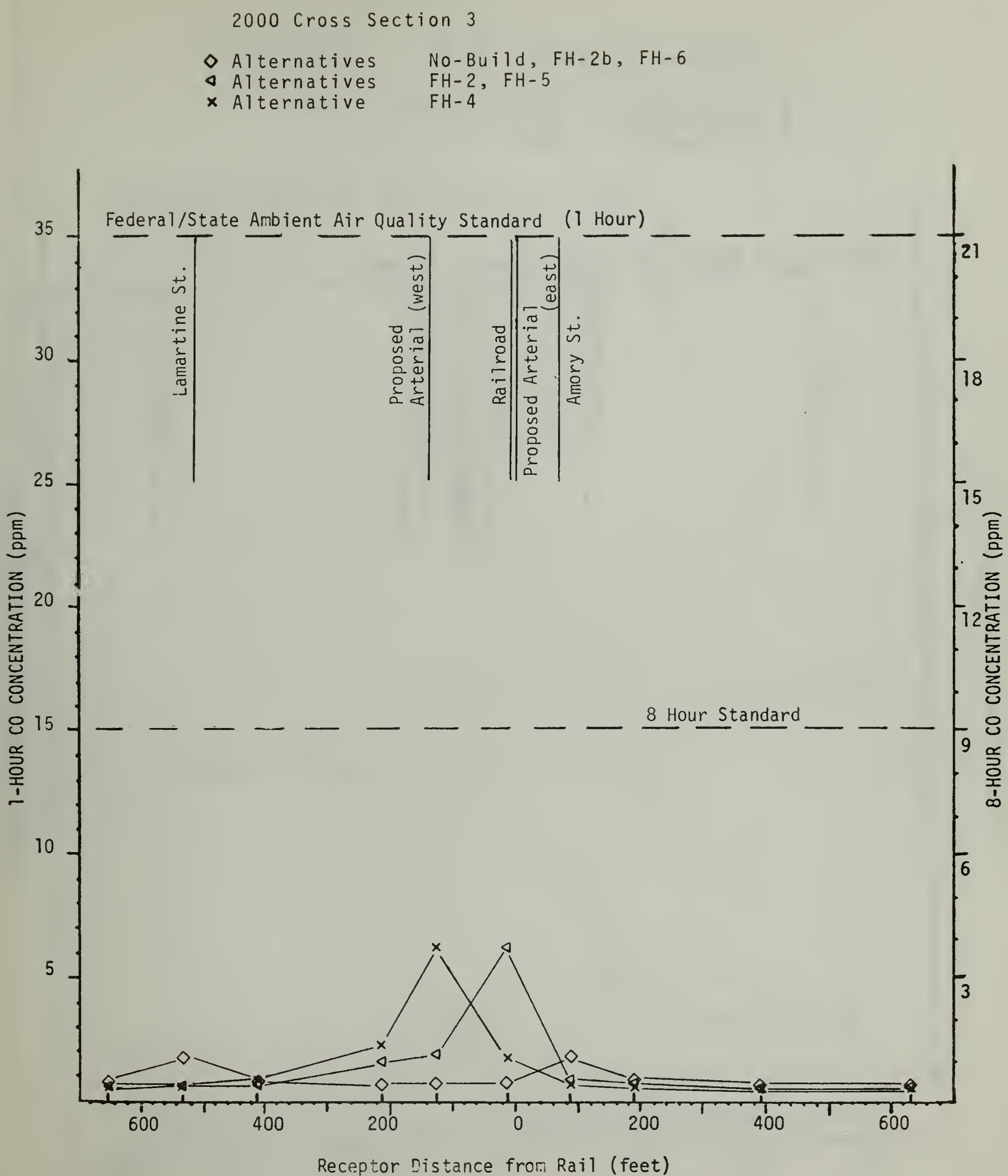
◇ Alternatives No-Build, FH-2b, FH-6
◁ Alternatives FH-2, FH-5
× Alternative FH-4



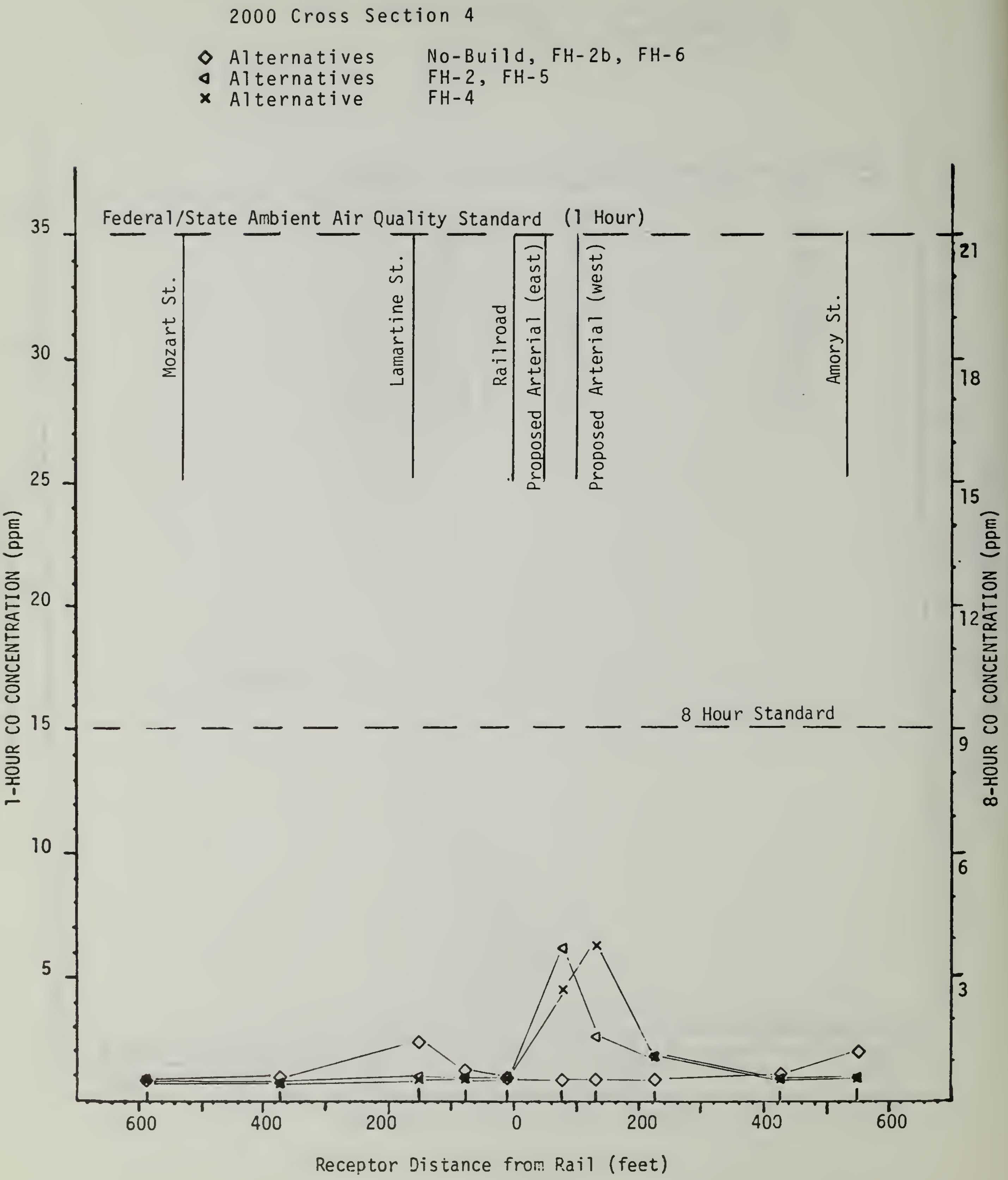
(FIG. B-15)


2000 Cross Section 2
Alternatives No-Build, FH-2b, FH-6
Alternatives FH-2, FH-5
Alternative FH-4
Federal/State Ambient Air Quality Standard (1 Hour)
Call Street
Proposed Arterial (west)
Railroad
Proposed Arterial (east)
Washington St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

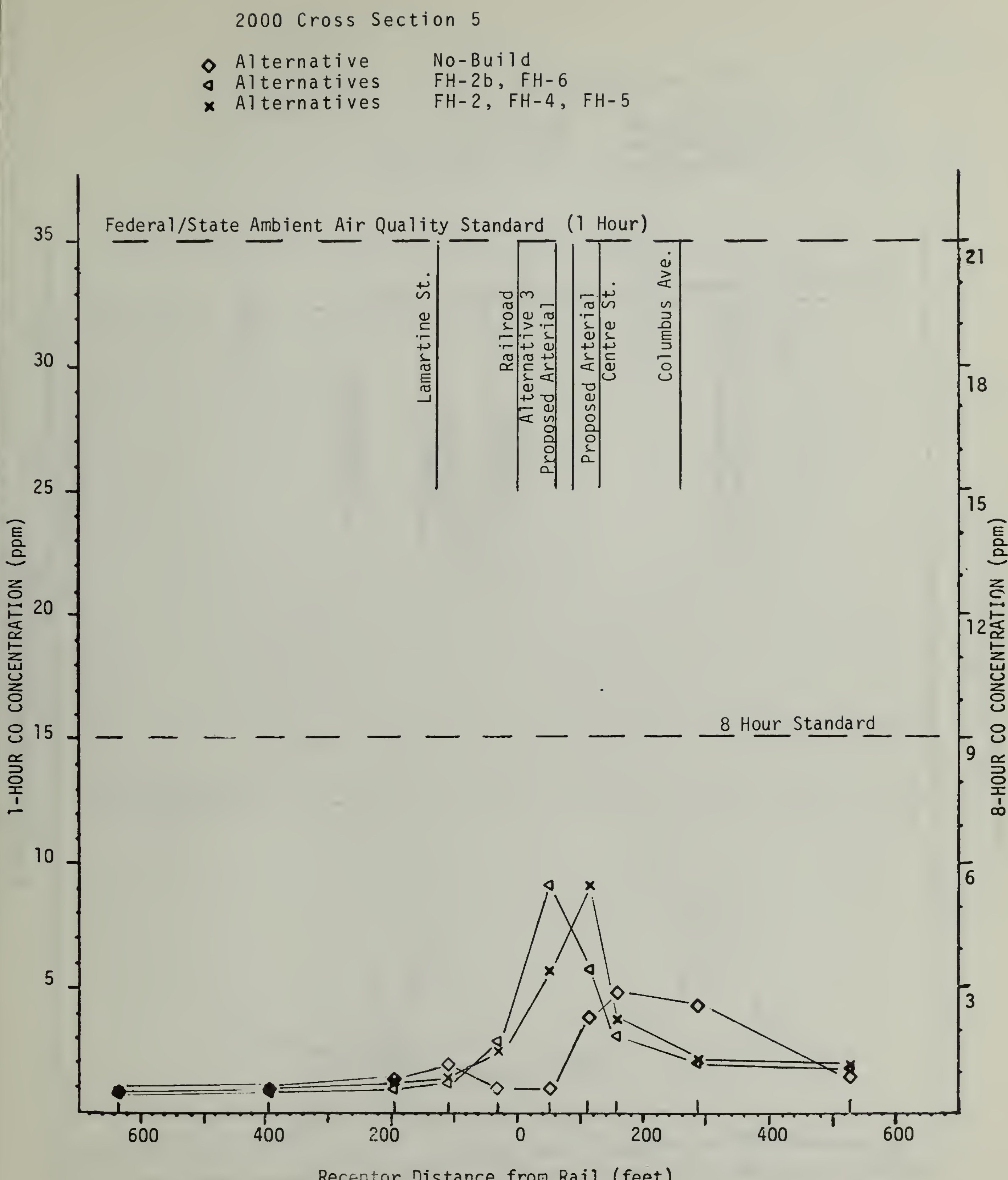
(FIG. B-16)


2000 Cross Section 3
◇ Alternatives No-Build, FH-2b, FH-6
◁ Alternatives FH-2, FH-5
× Alternative FH-4
Federal/State Ambient Air Quality Standard (1 Hour)
Lamartine St.
Proposed Arterial (west)
Railroad
Proposed Arterial (east)
Amory St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

(FIG. B-17)


2000 Cross Section 4
◇ Alternatives No-Build, FH-2b, FH-6
◁ Alternatives FH-2, FH-5
× Alternative FH-4
Federal/State Ambient Air Quality Standard (1 Hour)
Mozart St.
Lamartine St.
Railroad
Proposed Arterial (east)
Proposed Arterial (west)
Amory St.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

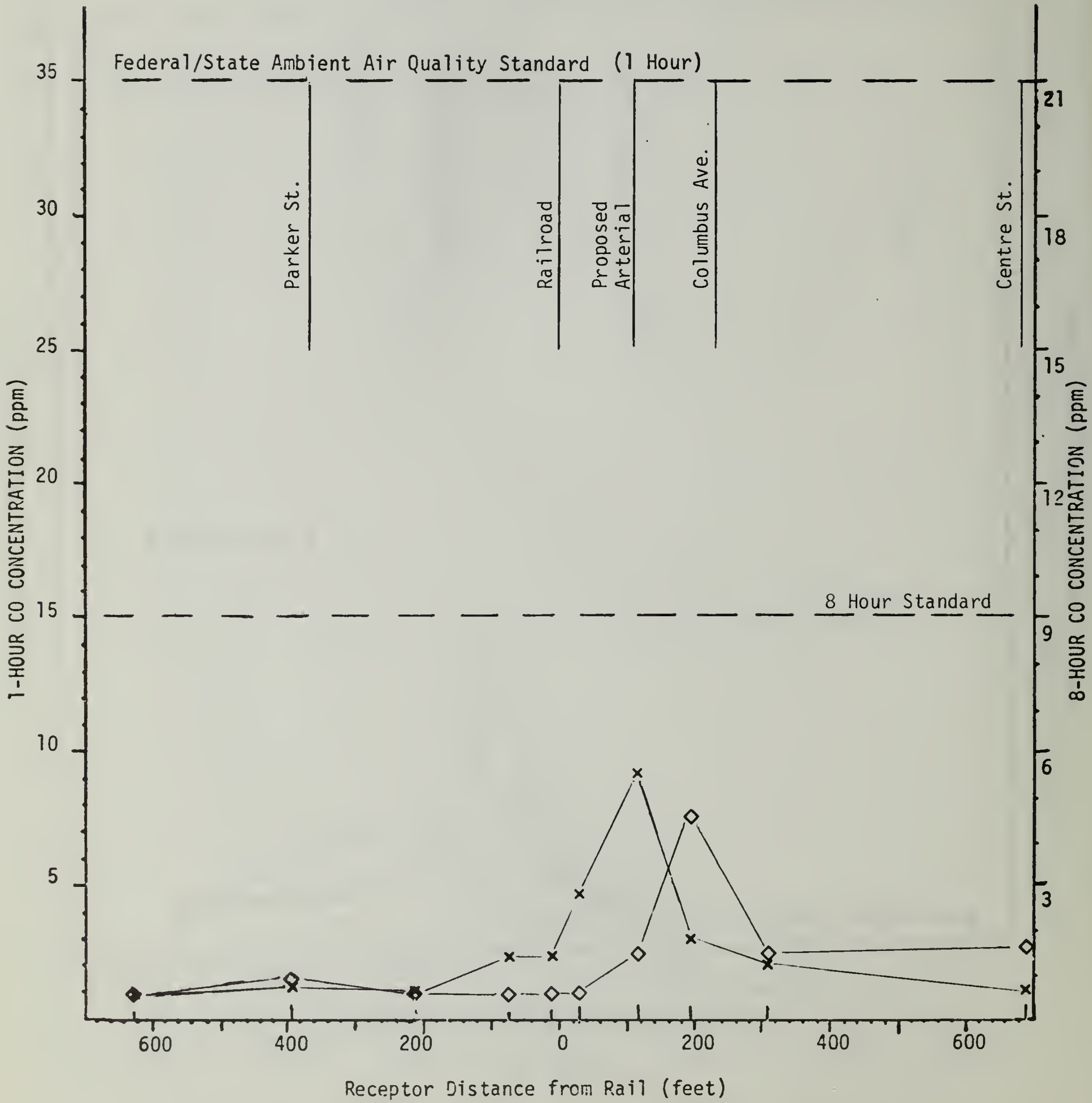
(FIG. B-18)


2000 Cross Section 5
Alternative No-Build
Alternatives FH-2b, FH-6
Alternatives FH-2, FH-4, FH-5
Federal/State Ambient Air Quality Standard (1 Hour)
Lamartine St.
Railroad
Alternative 3
Proposed Arterial
Proposed Arterial
Centre St.
Columbus Ave.
8 Hour Standard
1-HOUR CO CONCENTRATION (ppm)
8-HOUR CO CONCENTRATION (ppm)
35
30
25
20
15
10
5
21
18
15
12
9
6
3
600
400
200
0
200
400
600
Receptor Distance from Rail (feet)

(FIG. B-19)

2000 Cross Section 6

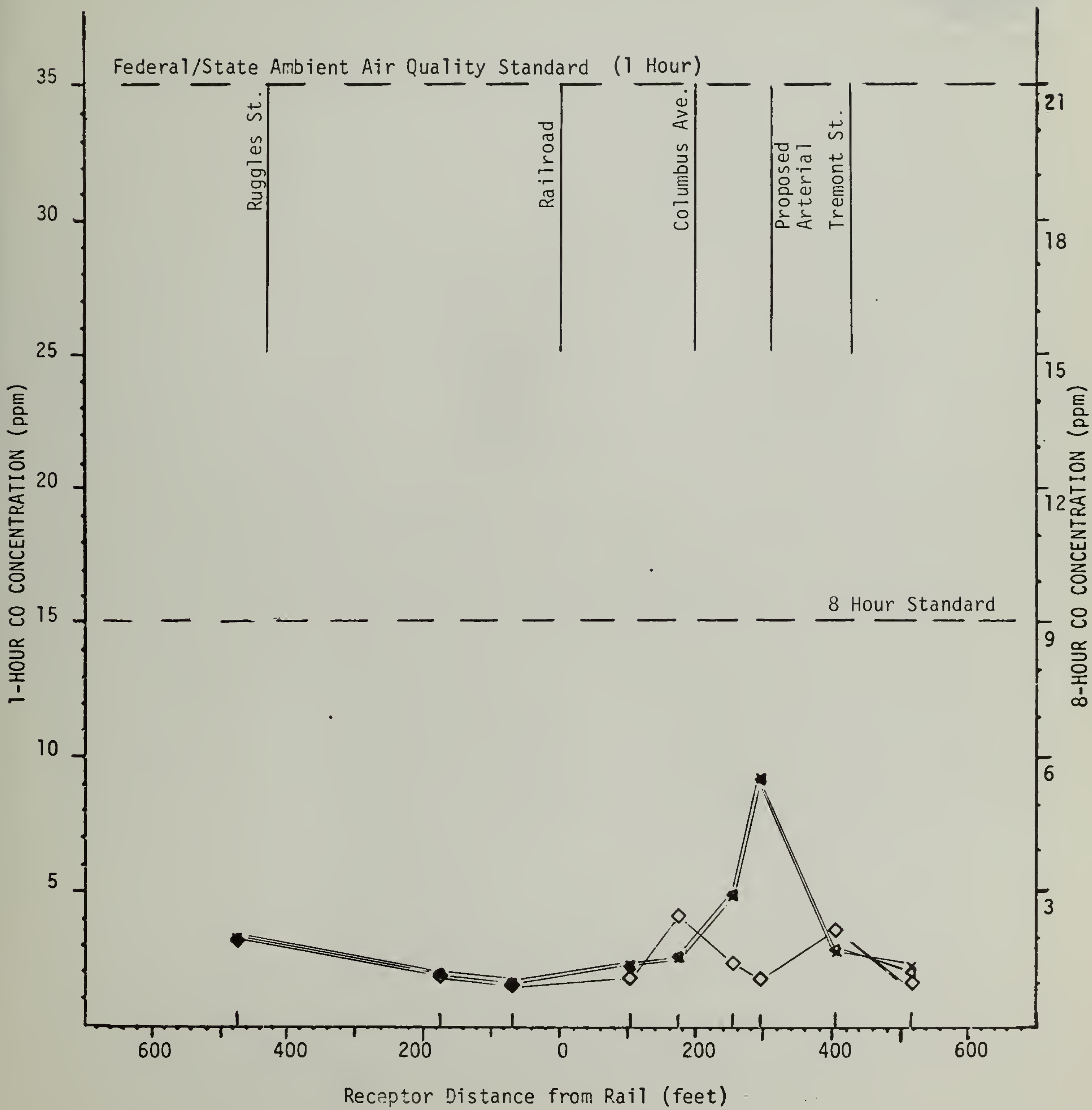
◇ Alternative No-Build
◁ Alternatives FH-2b, FH-6
× Alternatives FH-2, FH-4, FH-5



(FIG. B-20)

2000 Cross Section 7

◇ Alternative No-Build
◁ Alternatives FH-2b, FH-6
× Alternatives FH-2, FH-4, FH-5



(FIG. B-21)

C
APPENDIX

Appendix C

TRANSPORTATION ANALYSIS

Contents

Appendix C

TRANSPORTATION ANALYSIS

The transportation analysis examines rail teachnologies, ridership, operating costs, and direct user benefit of transportation time savings. The analysis is based on a full application of the Urban Transportation Planning Cycle. The projection methodology used in the analysis is shown in Fig. C-1.

RAIL TECHNOLOGIES EVALUATED. A series of rail technologies were selected for evaluation, to permit a broad-ranging investigation of the possibilities for the Southwest Corridor. In the early testing, express bus service was also included, but was eliminated in the Arterial Street options for a variety of reasons (principally the distances of expressways from the neighborhoods to be served by the corridor). The appropriateness of the various rail modes in application to Southwest service is discussed below. Commuter rail is useful as long as the frequency of service is less than 10 trains per hour. It can be operated over existing rail lines with no requirement for added grade-separation and the tracks can also accomodate other rail traffic. Conventional commuter rail rolling stock is compatible with high-platform stations, but the platform height and lateral placement differs from the measurements of rapid transit platforms, and such platforms are compatible with freight car operation.

Rolling stock operated over conventional railroad trackage must meet safety standards, including required buffing strengths. Existing commuter rail rolling stock, because of relatively low rates of acceleration and deceleration and slow loading/unloading, is not suited to operations with close station spacing. For this reason it is heavily dependent upon vehicular rather than pedestrian access to stations, and is best adapted to suburban commuter trips of substantial length.

The dual power vehicle, if used in joint railroad/rapid transit service, must reconcile a number of differing requirements including buffing strength, acceptable dimensions, high/low platform loading seating standards, method of fare collection, crew regulations, normal train length, tunnel ventilation and safety, etc. There are presently no U.S. self-propelled rail cars that will fit into Orange Line tunnels, nor any rapid transit cars of Orange Line dimensions that meet railroad buffing-strength requirements.

For a variety of reasons, the dual power vehicle concept on which Southwest Corridor analyses are based would employ a separate vehicle as an electricity generating source. To avoid carrying fuel into electrified tunnels, a practice which the Massachusetts Department of Public Utilities forbids, the "power car" would be detached from a train at the point where right-of-way electrification commenced. The buffing strength and institutional problems of joint railroad/rapid transit operation suggest application of the dual power vehicle only on rail lines given over to exclusive rapid transit use. Conversion of stations of such a line to high platform configuration may be preferable to modification of transit cars for both low and high platforms.

Studies indicate that in most applications, overhead catenary electrification may be a lower-cost alternative to the power car for dual power operation. This approach would involve equipping vehicles with both third-rail pickup for inner city operation and pantograph or trolley-pole pickup for overhead electricationin the outer areas - a readily available, off-the-shelf technology, presently used on the Blue Line. Overhead electrification for moderate frequencies can be used without grade-separation and fencing of the right-of-way. However, for rapid transit frequencies, full grade-separation, fencing and high-platform stations similar to third-rail transit are required.

The evaluation of power car service and catenary transit service involves the comparison of variable capital costs for rapid transit cars, power cars, storage and maintenance facilities, electrification of right-of-way, and power plant, and operating costs for maintenance and for delays from coupling and uncoupling power cars.

Highway Network. A 1980 highway network was coded for the entire (152-city-and-town) Eastern Massachusetts Region by updating an existing 1963 network. Because this 1980 network was to be used only to derive travel times for input to trip distribution and modal split, however, (i.e., it was not intended that assignments be made to this network), the coding was simplified in certain areas. For example, ramps at some interchanges were not explicitly coded and relatively minor arterial improvements were not all included. In addition, only distance and morning peak period and off-peak period travel times for the links were coded (i.e., such data as zero-volume speed and functional classification were not coded). In addition, an arterial between Forest Hills and Massachusetts Avenue was coded into the 1980 highway network for purposes of calculation only.

Transit Networks. The 1980 computer processible transit networks were likewise updated from an existing 1963 transit network. These were the so-called 'No Build' and 'Relocated' transit networks. For the Southwest Corridor, the 'No Build' network was comprised of the existing Orange Line (on the elevated structure) from Downtown Boston to Forest Hills and commuter railroad service on the Needham Branch from South Shation to Needham Heights. The feeder bus network was assumed to be the same as exists today. For a detailed description of this bus network, see Fig. III-2 in the text. 'Relocated' network, on the other hand, was coded to include rapid transit service from the downtown Boston area, through Forest Hills to Needham, with this service alignment along the existing Penn Central right-of-way. With this facility relocation, commuter railroad service on the Needham branch was assumed to be terminated. Manual adjustments were made to these forecasts to obtain boardings at the Forest Hills station in the alternative that terminates Orange Line service at that point. See Fig. V-5 for details of the proposed bus network for the 'Relocated' alternative.

The third transit service alternative considered was the so-called 'Shawmut Avenue Subway' alternative. Whereas a computer processible representation for this alternative was not produced, an estimate of patronage was made and a description is presented herein for completeness. The 'No Build' forecast was used as a basis for estimating the 'Shawmut Avenue Subway' alternative patronage by applying elasticities developed from the Automoted Corridor Model. The elasticities are in the form of a series of graphs that relate a change in travel time with a change in modal split. This implies that the feeder bus route networks for the 'Shawmut Avenue Subway' alternative is exactly the same as the 'No Build' alternative since station and market are constant in both alternatives.

The commuter rail service for three of these alternatives was assumed to be the same, that is, no change from the existing service.

Trip End Generation. Trip end generation (the estimation of trip ends produced and trip ends attracted in each MDPW 894 Traffic Zones) was carried out using regression equations previously calibrated to Eastern Massachusetts data for the Massachusetts Department of Public Works/Bureau of Transportation Planning and Development (MDPW/BTP&D). These estimation relationships are stratified by transit accessibility and thus the estimated trip ends are sensitive to the transit service being tested (two estimates were made; one estimate for the 'No Build' alternative and one for the 'Relocated' alternative).

The complete passes of a "conventional" transportation planning process calibrated to Eastern Massachusetts have now been completed; passes that assumed the 'No Build' and the 'Relocated' facilities in the computer processible transit network description. The estimates for the Shawmut Avenue Subway alternative were then developed manually using portions of the computer modelling process and the results from the other two alternatives.

General Procedures. The procedures used to produce the patronage estimates involved estimation of population and employment levels in each of the 894 MDPW Traffic Zones within the Eastern Massachusetts Region, network "coding" of proposed 1980 Highway and Transit Systems (preparation of data in formats suitable for computer processing), estimation of trip ends, distribution of these estimated trip ends, estimation of modal choice (probability of using a specific primary mode, in this case transit) including choice of access mode for reaching transit, and assignment of transit trips to the proposed transit facilities/services. A detailed flow of these work steps is depicted in Figure C-1.

Population and Employment Estimates. An estimate of 1980 Population and Employment levels in each of the 894 MDPW Traffic Zones that comprise the Eastern Massachusetts Region was made. These estimates took into account exiting activity levels (1970) and various other further modifications were incorporated based upon building permit information collected by the Boston Redevelopment Authority (BRA) and other agencies. A summary of these estimates of population in the Southwest Corridor appears in Figure C-2.

Network Coding. The procedures followed involved the coding of separate computer representations of a proposed 1980 highway network and the alternative 1980 transit networks to be tested.

Catenary transit is more sensitive to line length, due to the fixed costs of electrification; whereas power car costs are more sensitive to train frequencies, because of coupling delay times and numbers of power cars required. However, catenary transit proves less costly for any line length (up to 25 miles) with frequencies of 5 per hour or greater, and for line lengths up to 12 miles with frequencies of 3 per hour or greater.

Rapid transit equipment, because of its high performance and rapid high platform loading, is suited to station spacings as short as one-half mile or less. The average spacing tends to be dictated by the size and cost (both construction and operation) of stations more than vehicle operating characteristics. Compared to commuter rail, more walk-in ridership can be accomodated but feeder services remain important. The need for passengers to descend to below-grade stations and then ascend at the end of a trip makes rapid transit inefficient for very short trips. Rapid transit typically provides very high capacities by means of multi-car trains operated as frequently as every 90 seconds. Closer spacing of trains is normally found to be incompatible with the speeds and train lengths involved. Two or sometimes three branches are a practical maximum for rapid transit because service frequency would be inadequate with more branches. Branches ideally should be of nearly equal loading to facilitate division of services. The magnitude of investment required for rapid transit lines mitigates against their inefficient utilization.

Light rail*, the Green Line technology, has performance characteristics similar to rapid transit but is adapted by means of low-platform boarding to frequent stops, with ease and speed of passenger access offsetting the slower operating speed resulting from close stop-spacing. Light rail can be up-

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* The Standard LRV would not be compatible with existing and new rail transit cars on the Orange Line or with the stations on the Orange Line.

graded by grade-separation (running in cuts or tunnel as "subway-surface" surface) and even provision of high-platform stations where desired; tram cars providing interchangeably for low and high platforms are common in German cities, and are on order for San Francisco. Thus, the technology is well-suited to incremental improvement, such as piecemeal replacement of a surface line with a subway or elevated line.

Light rail can be faster than equivalent bus service and can be operated directly into downtown subways, yet its accessibility and close stop-spacing (as little as one-fourth mile or less on the surface) make the technology useful for short local trips as well as moderate-length line-haul travel. Street running operation precludes use of trains longer than about 150 feet overall, but at these lengths and the speeds involved, headways as short as 45 seconds can be attained, using stations which accomodate two trains simultaneously. Line capacities, therefore, approach those of rapid transit. This high trunk-line frequency makes light rail well-suited to systems having several branches, since headways can remain acceptable on each branch despite the dividing of service.

TRAVEL FORECASTING This section describes the assumptions and procedures used in the preparation of patronage estimates for those alternative transit service configurations for the Southwest Corridor. The transit configurations tested are as follows:

- 'No Build' Alternative
- 'Shawmut Avenue Subway' Alignment
- 'Relocated' Alignment in the existing Penn Central Main right-of-way

Trip Distribution. Trip distribution was performed again using a gravity model formulation developed previously for MDPW/BTP&D although CTPS recalibrated "F-factors" for this model to more closely replicate observed calibration-year (1963) trip length frequency distributions. Travel times input to the gravity model were combined highway-transit travel times. An electrical conductance type of formula was used for this combining function. Transit travel times were peak period "perceived" travel times, with the difference between actual and perceived travel times being represented by a "penalty time" added to auto access links and a 2.5 multiplier applied to wait and transfer links. Highway travel times were average 24-hour times computed as weighted functions of peak period and off-peak period times. Three separate sets of 24-hour highway travel times were thus computed; one set for home based work trips, one set for non-home based trips, and one set for the three other-home-based trip purposes (school, social-recreation, shop-personal business). These travel times were used to distribute 24-hour trips among the 984 Traffic Zones in the Eastern Massachusetts Region for each of the five trip purposes. Using 1963 O-D data, factors were developed and applied to 24-hour trips to produce an estimate of morning peak period travel. Since the trip distribution process is again sensitive to the transportation (transit) system under consideration, two different forecasts were made for the 'No Build' and 'Relocated' alternatives.

Modal Split. Modal split analysis was performed for the morning peak period (7-10 A.m.) only, using a modal split (transit probability) model calibrated and applied previously for the MBTA, the Eastern Massachusetts Regional Planning Project, and the Massachusetts DPW. This model, comprised of a family of diversion curves, estimates the (post-distribution) modal split (between transit and highway modes) for given pairs of zones as a function of the trip-maker and of the transit/highway ratio of total (door-to-door) travel time, "excess" time (roughly, out-of-vehicle time), and out-of-pocket cost. "Sub-modal split" is input by a manual process based upon examination of topography, development patterns, and transportation service characteristics.

For example, for each origin zone and for each major group of destination zones, the access modes and stations which will be utilized by those persons making a transit trip are specified on a percentage basis. Sub-modal split is estimated prior to modal split, and transit impedances between pairs of zones are estimated as weighted averages. The separate estimates were made for the 'No Build' and the 'Relocated' alternatives using the full modal split model.

For the 'Shawmut Avenue Subway' alternative, a submodel of the modal split model was used to relate the change in service characteristics of that alternative to change in estimated patronage. This analysis procedure, known as sensitivity analysis, related change in modal split, and thus transit usage, to the same four factors that comprised the total modal split estimation.

Transit Assignment. The transit assignment procedure which was utilized combined the (input) sub-modal splits with the peak period transit travel (trip table) output by the modal split process to generate estimates of line volumes station boardings and deboardings, and mode of access to each station by zone of origin. The present efforts explicitly considered destinations only in the regional core, an area encompassing Downtown Boston and surroudnig areas such as the Fenway, Roxbury and Cambridge. These transit assignments were performed directly for the 'No Build" and "Relocated" configurations, and the 'Shawmut Avenue Subway' was assigned by using the "No Build' results and the results of the sensitiveity analysis. Once the peak period assignments were complete, estimates of 1980 24-hour (daily) patronage for each alternative were computed based upon existing relationships between morning peak period and daily usage. These relationships were derived primarily from the 1965 MBTA Special Count data and other boarding surveys that have been done for the MBTA in the past fe years. The 1980 daily boarding estimates were extended to the year 1995 based upon projected changes in population growth throughout the Southwest Corridor.

Commuter Rail Forecasts - Methodology. The commuter rail forecasts are based on a range of 1980 forecasts for commuter rail ridership. This, of course, differs from the standard methodology of relying on one forecast year projection. The range was used in the analysis because of the often-observed difficulty of the regional travel forecasting to replicate the fine-grained details of the commuter rail market. Section 4.5 refers to a growth in the SW car lines of 30% and 40% over the base (1974) case ridership.

The 30% increase was based on the automated modelling procedure described above. More specifically, the model predicts a 26% rise in patronage based soley on demographic change (corridor populations and core employment) and improved running speeds. The improved headways under consideration in the CRIP program were then factored in by use of manual "elasticities" for improved access and out-of-vehicle times derived from the modal split curves used in the Process. Consideration of the headway improvements led to the 30% estimate for increase in CRR ridership.

Simultaneously, trend lines were established to compare with the travel forecasts. It was established that since 1971, the lines have been increasing at a rate of 8.36% per year. "Straight lined," this would represent a 50% increase by 1980 over the base year. The 40% figure was arbitrarily established as the upper end of the range, given most recent moderating trends in ridership since the end of the "energy crisis."

Operating Costs. This section of the EIS describes the methodology used to analyze the operating costs of proposed transit services in the SW corridor. Because the future trends of wages, material and fuel costs, and productivity are always uncertain, it was decided that estimates of costs of all new services would be based on present unit costs. Initially 1973 was used as the base year, but the formulas were revised to reflect 1974 cost structure when complete data for that year became available.

OPERATING COST CALCULATIONS The primary sources of information used in preparing the cost formulas were the MBTA Statement of Cost of Service and Cents per Revenue mile for fiscal years 1965-1974, the MBTA Responsibility Accounting Manual, the monthly Function/Work Order Computer printouts and annual summary for Calendar year 1974, and the Itemized Budget of the MBTA for Calendar year 1975.

The purpose in examining the Statements of Cost over ten years was to identify unusual non-recurring cost items and items repeating in multi-year cycles. When comparing expenses for different years for this purpose a wage-price index was applied to convert data to a common base. The investigation covered bus, light rail and rapid transit services, but did not include trackless trolley. Rapid transit and light rail costs were studied in more detail then bus costs because they are considerably more complex. Because the objective of the cost formulas is to measure the change in costs resulting from a service change, rather than the absolute costs, all cost items that are systemwide costs not directly attributable to individual services were excluded. Most such items are included in the category "General".

For each of the three modes examined costs were divided into four categories:

a) Vehicle mile variable costs
b) Vehicle hour variable costs
c) Fixed facility costs
d) Proportional costs

Vehicle mile variable costs included vehicle maintenance and servicing expenses, fuel and other power expenses, maintenance of trolley wire or catenary where used, and wages of miscellaneous car service employees. Vehicle hour costs included wages of train crews and supervisors. Fixed facility expenses for the rail modes were subdivided into track-mile, route-mile and station costs for above ground lines, plus tunnel-mile costs for subway lines. Track mile costs included inspection, maintenance and repair of track, third rail where used, signals, and interlockers. Both field work and related shop expenses were included. Route-mile costs included such items as removal of snow and ice (average year), and maintenance of power distribution cables, fences, signs, communication systems, and headway recorders.

Station costs included wages of collectors and porters, electrical and structural maintenance and repairs to stations, repair of vandalism damage, rubbish removal, and maintenance of fare collection and fire protection equipment. Maintenance and service of escalators was calculated separately, where applicable. An extra cost for dispatching was added at all train turnback points. Tunnel-mile costs included structural maintenance of tunnels outside stations, and maintenance of lights and pumps.

Variable route-mile costs for buses are difficult to estimate from available data due to the considerable overlapping of routes but an amount to represent costs of shelters and bus stop signs and markings is included in the bus cost formula.

Proportional costs included the MBTA's share of pensions, social security taxes, workmen's compensation and group insurance plus store expenses. The proportion factors for each mode varied according to the relative expenses for labor and materials, since the fringe benefits apply to labor only and the store expenses to materials only.

In the formulas the cost of injuries and damages and claims settled was assumed to vary with the magnitude of vehicle miles but not directly with small changes in mileage. Therefore this cost was expressed in proportion to 100,000 car miles rounded to the nearest 50,000. These costs were based on five year averages due to the fact that the accident rate varies from year to year.

The component for the three modes are summarized in Fig. C-3, -4, and -5. In the case of light rail, the car-mile cost is an estimate derived from existing rapid transit and light rail costs, because there is as yet no operating experience with the new LRV's.

USER BENEFIT CALCULATIONS. User benefits for all Southwest Corridor options were computed in terms of the perceived travel time changes, valued at $3.00 per hour. Computer representations of two transit service networks for the southwest were coded, one for the no-build option and its feeder services, the other for the relocated Orange line and its feeder services. Time spent aboard vehicles or walking either in access to the transit system or in distribution was weighted at 1 perceived minute for each actual minute. Time spent waiting for either rapid transit trains on feeder services was weighted at 2.5 perceived minutes for every actual minute. Average waiting time was assumed to equal one-half of headway. From the two networks transit travel times between the centroids of all traffic zones in the region were computed.

For the Southwest Corridor analysis travel times to downtown Boston and to Copley Square from all zones served by the Orange Line were compared for the no-build and relocated Orange Line options. From Essex station north the no-build and relocated Orange Lines would be identical, so any changes in travel time would occur south of Essex. Therefore, for trips originating in a given zone travel time changes to all zones north of Essex would be the same. Between 80 and 90% of trips from the southwest would have destinations north of Essex. Most of the rest would have a variety of destinations served by Back Bay station. It was determined that for trips in the latter category the average travel time saving from a given zone would be equal to the change in travel time from that zone to Copley Square.

The total travel time change perceived by each zone was measured by multiplying the number of daily Orange Line riders originating in the zone by a composite travel time change based on the changes to Back Bay and to downtown Boston from that zone. The weighting factor varied from 80 to 100 % for downtown Boston based on the known travel if the relocated line increase travel time. The ridership used in the time change calculation was that of the Relocated Line if ridership increased and that of the existing line if ridership decreased. In this way both benefits to new riders and disbenefits to lost riders were included along with benefits and disbenefits to riders using both systems.

A network including the Shawmut Avenue subway alignment has not been coded. However, most of the stations would be in the same locations as no-build stations and so only rapid-transit on-vehicle time would differ from the no-build option. Therefore, user benefits for most stations in the Shawmut Avenue option were based on comparative vehicle and walking access times in reaching the transit system. The analysis of travel time changes for the Southwest replacement service was based on a comparison of the sums of walking access times and running times to downtown Boston via the existing Orange Line and via a replacement service for all zones within walking distance of the replacement service.

User benefits were also computed for trips originating on the Orange Line north of Boston or on connecting rapid transit lines and using the relocated line stations at South Cove and Back Bay for distribution. At present Back Bay trips are served by Arlington, Copley,Auditorium, and Prudential stations on the Green line and South Cove is served by Essex and Dover stations on the Orange Line. Travel times from all rapid transit lines to all zones that would be served by Back Bay or South Cove stations were computed for the existing transit networks and for the Relocated Orange Line network. All trips for which the relocated line would reduce travel time were assumed to direct to it. For each transit corridor the number of trips destined for each zone found to be served best by the relocated Orange Line was determined using CTPS-UTRAP trip tables. For each zone the number of trips was multiplied by the time reduction for the relocated line, to produce total time savings.

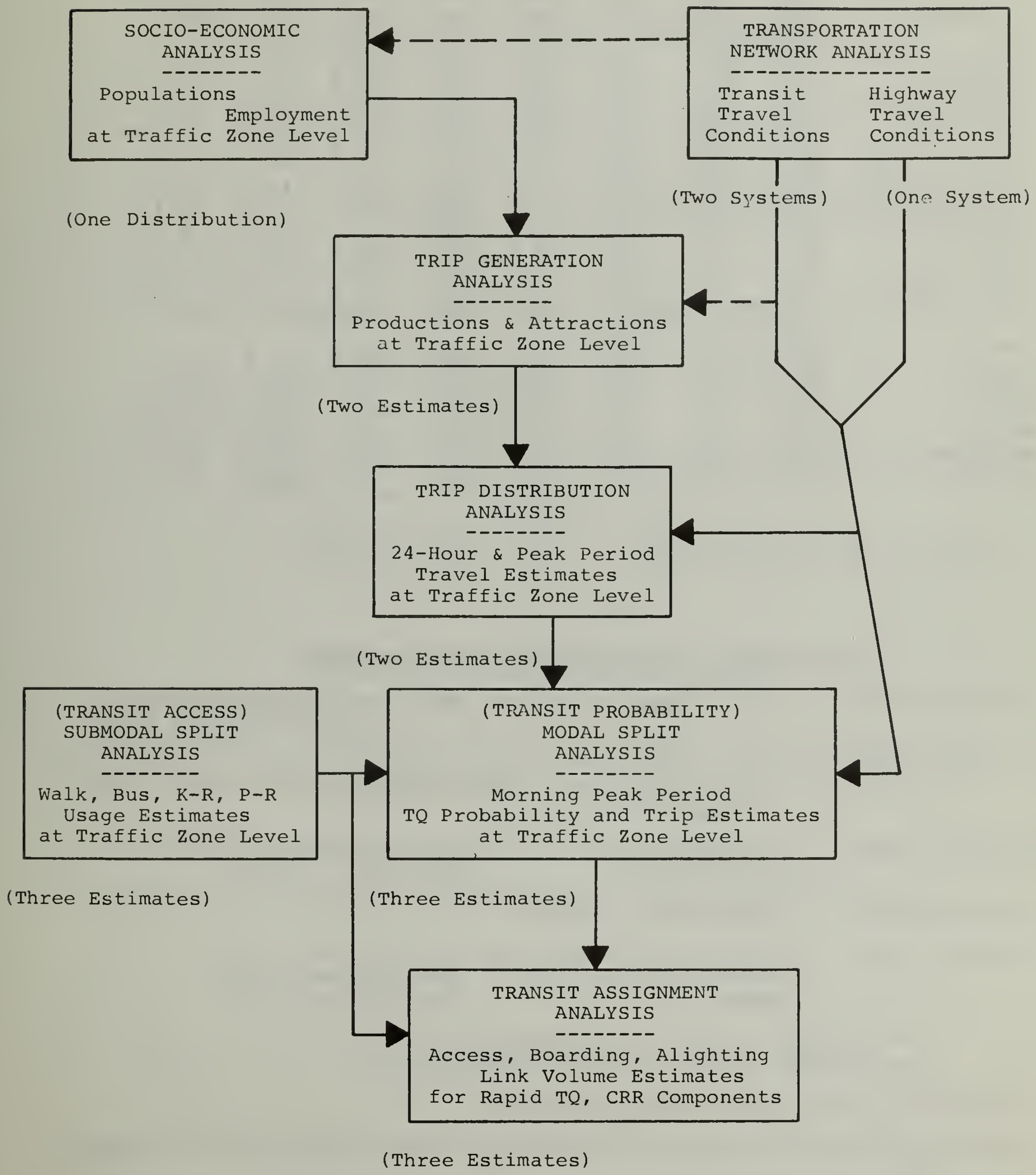
Sample Travel Time Savings Calculation for Southwest Corridor

The method used to compute travel time savings resulting from the Orange Line relocation is illustrated below for zone 102 in Jamaica Plain (Section IV, Figure IV-16). This zone is bounded on the north and west by Centre Street, on the south by Spring Park Avenue, Chestnut Avenue, and Boylston Street, and on the east by Penn Central Alignment. The transit skim time printouts show that from zone 102 to zone 047, taken as representative of downtown destinations, average transit time would be 29.0 minutes with the existing Orange Line, but only 23.1 minutes with the relocated Orange Line, or a reduction of 5.9 minutes. From zone 102 to zone 672, taken as representative of Back Bay destinations transit time would be 32.1 minutes with the base network but only 24.3 minutes with the relocated Orange Line, or a reduction of 7.8 minutes. Assuming that 80% of relocated Orange Line demand from zone 102 is destined for downtown and 20% for Back Bay, the weighted average travel time saving from zone 102 would be (0.8)(5.9) + (0.2)(7.8) = 6.28 minutes. An estimated 1570 inbound daily riders from zone 102 would use the relocated Orange Line in 1980 if it were operating. Assuming that inbound and outbound ridership is equal, and that travel time savings are the same in both directions, daily zone 102 time savings compared to the base system would be (2)(1570)(6.28) = 19719.2 person-minutes, or 328.7 person-hours. Taking annual savings as 300 times daily savings results in an estimate of 98,610 person-hours per year saved in zone 102. At a value of $3.00 per hour, the value of this saving is $295,830.

(FIG. C-1)

DETAILED PROJECTION METHODOLOGY

Orange Line Southwest



(FIG. C-2)

POPULATION AND EMPLOYMENT FORECASTS FOR SOUTHWEST CORRIDOR (in thousands)

Community	1963 Pop.	1963 Emp.	1970 Pop.	1970 Emp.	1980 Pop.	1980 Emp.	1995 Pop.	1995 Emp.
Boston Proper	78.7	246.3	67.3	251.3	70.0	266.1	72.0	299.3
Brighton	64.1	17.7	63.5	18.4	56.0	19.2	55.0	21.6
Charlestown	20.9	16.9	15.4	13.9	14.0	13.7	14.0	15.4
Dorchester	158.9	16.8	166.0	20.4	160.0	23.2	157.0	26.0
East Boston	46.0	9.9	39.1	11.0	32.5	13.8	31.0	15.5
Hyde Park	39.0	5.1	38.5	5.6	37.0	6.0	40.0	6.7
Jamaica Plain	57.8	6.9	48.1	7.3	44.0	7.8	43.0	8.8
P-Hill/Fenway	44.6	39.7	44.9	40.6	40.5	41.2	41.0	46.3
Roslindale	33.5	2.8	28.2	3.4	29.0	3.7	32.0	4.2
Roxbury	85.0	15.7	62.2	14.2	55.0	14.7	53.0	16.5
South Boston	49.5	37.7	42.9	40.2	37.0	45.8	35.0	51.5
West Roxbury	18.9	1.9	24.9	2.6	25.0	2.8	27.0	3.2
Boston Total	696.9	417.1	641.0	428.9	600.0	458.0	600.0	515.0
Needham	27.9	11.5	29.7	15.7	32.0	16.0	35.0	16.5
Newton	92.5	27.6	91.1	30.4	93.0	35.5	95.0	36.0
Dedham	25.2	7.1	26.9	13.6	27.5	12.5	28.0	14.0
Dover	3.3	0.3	4.5	0.3	7.5	2.5	9.0	4.0
Medfield	6.9	1.4	9.8	1.0	12.5	2.5	15.5	2.8
Wellesley	26.1	6.8	28,1	9.3	30.0	12.0	34.0	12.5
Westwood	11.7	1.9	12.8	2.7	16.0	4.0	20.0	6.5

(FIG. C-3)

RAPID TRANSIT COST COMPONENTS - 1974 DATA BASE

A. Car-mile cost (1.04) (Daily Car Miles) (300) For overhead catenary (1.10) instead of (1.04)

B. Car hour cost (2.64) (Sched. 1-way time in Hrs.) x [(6.28) (daily trips)+ (6.21) (2-car trips)+(12.42) (4-car trips)] (300)

C. Track-mi cost
- with third rail (Track miles) ($41,000)
- with catenary (Track miles) ($39,000)

D. Route mi cost (Route miles) ($17,500)

E. Station Cost
- Surface-South Shore Type $152,000 per station
- Surface-Blue Line Type $106,000 per station
- Subway $160,000 per station

Add $7,000 per year for each escalator
Add $50,000 per year for each dispatch point.

F. Tunnel mile cost (Tunnel miles) ($30,000)

G. Pensions and Gratuities and store expenses(0.219)(Sum of items A-F inclusive

H. Injuries and damages and claims settled $3,500 per 100,000 car miles

(FIG. C-4)

LIGHT RAIL COST COMPONENTS - 1974 DATA BASE

A. Car-mile cost (1.80) (Daily Car miles) (300)   Estimated for LRV

B. Car-Hour Cost (2.2) Sched. trip time 1-way in hrs) (6.45) (Daily trips)+ (6.21) (2-car trips)+(12.42) (3-car trips)] (300)

C. Track-mi Cost On private right of way, signalled (Track miles)($22,000)
In street or on reservation, no signals (Track mi)($21,000)

D. Route mi Cost (Route miles) ($12,000)

E. Station Cost

Highland Branch Type	$2,500 per station
Subway	$160,000 per station

Add $7,000 per year for each escalator

F. Tunnel mile cost (Tunnel miles) ($30,000)

G. Pensions and Gratuities and store expenses (0.227)(Sum of items A-F incl.)

H. Injuries and damages and claims settled

Subway of right of way	$10,000 per 100,000 car miles
Street on reservation	$20,000 per 100,000 car miles

(FIG. C-5)

BUS COST COMPONENTS - 1974 DATA BASE

A. Bus-mile cost ($0.61) (Daily bus miles) (100)

B. Bus-Hour cost (2.0)(Sched trip time 1-way)($6.33) (Daily trips) (300)

C. Route mi cost (Route miles) ($500) (Include only portions served by no other route)

D. Pensions and Gratuities and store expenses (0.252) (Sum of items A-C incl.)

E. Injuries and damages and claims settled 6,500 per 100,000 bus miles

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APPENDIX

Appendix D

RAIL SERVICE REPLACEMENT DURING CONSTRUCTION

Appendix D

RAIL SERVICE REPLACEMENT DURING CONSTRUCTION

I. SOUTH STATION TO BACK BAY SHUTTLE SERVICE PACKAGES

Description of Service Packages

Service Package A: Shuttle Train Service between South Station and Back Bay

Service Package A offers rail shuttle service on the tracks connecting South Station and Back Bay (known as the Boston Terminal.) Riders leaving Franklin, Stoughton, and Providence commuter trains would walk across a platform, board a waiting Budd car shuttle, and alight at a temporary rail stop near Back Bay Station. The shuttle would return to South Station with persons wishing to use the rail services at South Station.

In Service Package A, rail shuttles would meet every Franklin, Stoughton, and Providence train arriving in the AM peak period. Riders wishing to go to Back Bay would not have to wait an appreciable period of time for a shuttle. The rail shuttles could be scheduled to depart for Back Bay as soon as riders transferred from their train to the shuttle. During the AM peak period, there are two exceptions to this rule. Two of the shuttles respectively meet two arriving trains. Riders wishing to go to Back Bay from the first train must wait about five minutes for the shuttle's departure in each instance.

During the PM peak period, shuttle trains are scheduled to meet all but two of the Franklin, Stoughton, and Providence trains leaving South Station. In these two instances, riders using the shuttle service must wait at South Station six minutes for one train and ten minutes for another train. During the mid-day period, the majority of the arriving and departing commuter trains would be met by rail shuttles.

Trains scheduled before 7 AM or after 7 PM would not be met by rail shuttles in this service package. Weekend trains would not be met. Demand for shuttle service at these times does not seem to justify the cost of providing shuttle service by rail.

AMTRAK trains would not be served by rail shuttles in this package. Back Bay does not appear to be a final destination for a share of inter-regional and interstate rail users that is large enough to justify the cost of rail shuttle service.

Service Package B: Bus Service between South Station and Back Bay via the Mass Turnpike

Service Package B offers bus service between the two Boston rail stations via the Massachusetts Turnpike. The service could be offered if a ramp were constructed to allow westbound busses on the Turnpike to return eastbound to South Station. The ramp would be located near Exeter Street and Huntington Avenue.

In this Service Package, busses would meet Franklin, Stoughton, and Providence trains arriving at South Station. Rail riders of the rerouted branches and lines who wished to go to Back Bay would board buses at South Station. The buses would proceed to the Back Bay Station vicinity via Atlantic Avenue, Kneeland Street, and the Massachusetts Turnpike (Fig. D-1). The buses would then exit the westbound Turnpike and drop off riders at a stop near Stuart Street between Dartmouth Street and Huntington Avenue. Persons wishing to board the rerouted branches and lines could board the bus at this stop. The buses would then return to South Station via a ramp crossing the Mass Turnpike near Exeter Street. The ramp would permit westbound buses to reenter the Turnpike in the eastbound lane.

In Service Package B, buses would meet every Franklin, Stoughton, and Providence train arriving in the AM peak period. The buses would also be scheduled to arrive at South Station from the Back Bay stop prior to the departure of every rerouted commuter train in the PM peak period. During the mid-day period, the majority of the arriving and departing commuter trains would be

served by buses.

Trains scheduled before 7 AM and after 7 PM would not be served by bus in this service package. Trains scheduled on weekends will not met. Demand during the early and late periods of the day and on weekends does not appear to justify the costs of bus service.

AMTRAK trains would not be served by buses in service package. Back Bay does not appear to be a final destination for a share of inter-regional and interstate rail users large enough to justify the costs of bus service.

Service Package C: Bus Service between South Station and Back Bay via local streets.

Service Package C offers bus service to and from the same commuter rail arrivals and departures that are served in Service Package B. Service Package C differs from Service Package B in two respects. First, to serve Back Bay and South Station, buses operated in Service Package C use local streets instead of the Mass Turnpike. Second, the service in Package C can include stops at locations along the bus route in addition to serving the immediate vicinity of Back Bay Station. No intermediate locations can be served in Service Package B.

Buses leaving South Station in Service Package C proceed to Back Bay via Atlantic Avenue, Kneeland Street, Stuart Street, Eliot Street, Providence Street, St. James Avenue, Clarendon Street, Buckingham Street, and Dartmouth Street. (Fig. D-2). The buses will return to South Station via Dartmouth, Stuart, and Kneeland Streets and Atlantic Avenue.

Characteristics of Service Packages

Demand. For the purposes of determining frequency of service in the three service Packages, the demand for travel to and from Back Bay Station and vicinity was assumed to remain unchanged by the rerouting of Franklin, Stoughton, and Providence trains via the Midland Branch. It was also assumed that all travel to and from Back Bay Station and vicinity by users of the rerouted commuter trains would be made by the services offered in the three packages.

Neither assumption is completely realistic. Many persons currently using Back Bay Station do so because the inbound trains serve that station first. Their final destination may be located somewhere between the two Boston stations. (Some indication of the demand for travel to different Boston destinations is given in the Fringe Parking Study: Survey Findings, David A. Crane, Inc., 1975) When commuter rail service is rerouted via the Midland Barnch, Back Bay station and vicinity will be served after South Station. A transfer will be required to reach Back Bay. Daily demand for bus or rail service between South Station and Back Bay should be less than the present daily demand for Back Bay station by riders of the Franklin, Stoughton, and Providence trains.

The purpose of an optimistic assumption for demand for the service packages is to determine the highest possible operating expenses that could be justifiable with each service package. This procedure avoids underestimating the cost of the most favorable (from the economic standpoint) service package.

Under the assumption that demand for travel to and from Back Bay Station remains unchanged by rerouting commuter trains via the Midland Branch, daily demand for the Service Packages is as follows:

	To Back Bay	From Back Bay
Providence Trains	600	620
Franklin Trains	360	340
Stoughton Trains	180	140
	1,140	1,100

The demand for travel to Back Bay is severely peaked. Ninety-three percent of the daily demand for travel to Back Bay from South Station by riders of Providence, Stoughton, and Franklin trains occurs within a three hour AM peak period. Seventy-three percent of that peak period demand falls within one hour.

Demand for travel from Back Bay is also severely peaked. The three-hour PM peak period demand represents 87 percent of the demand for daily travel from Back Bay to South Station. The demand for peak hour travel from Back Bay accounts for 70 percent of the peak period travel.

Service Frequency and Capacity. Fig. D-3 compares the number of departures from Back Bay and from South Station and the capacities associated with each service package. Peak period travel demand represents a large share (over 90 percent) of the daily demand for travel to and from Back Bay by riders of the rerouted lines. Frequencies for the service packages were developed to allow buses or trains to meet every rerouted commuter train arriving at South Station in the AM peak period and to meet every rerouted commuter train departing from South Station in the PM peak period. The only exception to this is in Service Package A. The rail shuttle between South Station and Back Bay has scheduled departures from South Station that serve every AM peak period train arrival but two. In these instances, riders wishing to travel to Back Bay must wait five minutes between the time of their train's arrival and the shuttle's departure. During the PM peak period, the rail shuttle from Back Bay meets all but two trains. In one instance, riders from Back Bay must wait six minutes from the time of their arrival at South Station for their train to depart. In the other case, a ten minute wait is necessary.

Virtually every rerouted commuter train entering or departing South Station during the mid-day period will be met by a bus or rail shuttle. There are two arriving trains that will not be met immediately by service to Back Bay in any of the Service Packages. In one instance, riders will have to wait six minutes for a departure to Back Bay. In the other instance, an eleven minute wait is necessary.

Fig.D-3 shows that seated capacities offered in all three service packages exceed demand for travel to and from Back Bay. The number of bus departures scheduled in Service Packages B and C exceed the rail departures scheduled in Service Package A. This is because rail cars can be linked into trains while buses must depart individually. Several bus departures may be necessary to meet the demand for travel to Back Bay by riders of a rerouted commuter train. Only one rail shuttle departure is necessary to meet each train.

Travel Times. Fig. D-4 compares the travel times associated with the three service packages. Travel times associated with Packages A and B are the same. From the standpoint of travel time between South Station and Back Bay both packages are favorable to Service Package C.

Reliability and Convenience. Fig. D-5 presents a ranking of service packages several standpoints of reliability and convenience.

A package with a lower numerical ranking in a category is favorable to a package with a higher ranking. In some instances, two packages have the same rank in a particular category. This means that neither package is favorable to the other from this particular standpoint. The first category is arrival on schedule. Service Package A operates on a rail right-of-way between the two stations. There are six tracks on this right-of-way. The service package provides for a maximum of two shuttle trains operating simultaneously. Most of the commuter rail service will be rerouted from the right-of-way. The right-of-way would be used almost exclusively by the shuttle service. Travel times in Package A will not vary significantly. Of the services offered in the packages, the rail service will have the best record for on schedule arrivals. Bus service offered in Package C involves operation of buses entirely on local streets. Traffic congestion, construction, and parking violations are likely to contribute wide varations in travel time between South Station and Back Bay under Service Package C. Of the services offered, the bus service in Package C will have the poorest record for on schedule arrivals.

The second category is length of walk at South Station necessary to transfer between the commuter trains and shuttle vehicles. Rail shuttle service is ranked favorably to services involving buses. Riders of rerouted commuter trains can almost always transfer across a platform to reach shuttle trains. These riders must walk further to reach the buses.

The third category is the length waiting time necessary to transfer between vehicles at South Station. During the peak hour, several shuttle buses meet each train. Only one shuttle train meets each train. Buses have a greater potential than trains for loading and departing quickly. Service packages involving buses are ranked as favorable to rail shuttle service.

The final category is the convenience of location of pick up and drop off points within Back Bay. Bus service on local streets has the potential for serving several locations along the route without effecting operations of service. These locations served by Package C are closest to major employment sites, served by the packages. The Back Bay location served in Package B is more convenient than the location served in Package A for most riders. The location served in Package B is closer than Back Bay Station to employment, shopping, and MBTA transfer sites.

The comparison of service packages in Fig. D-5 does not show any of the packages as favorable to the others from all four categories listed. Some of the categories are more important to riders or operators than others. Schedule adherence is of particular concern to operators, who must schedule vehicles and assign drivers shifts. It is also of importance to riders who must meet trains that are scheduled to leave South Station or who must arrive at work at a fixed time. Service Package C, while it has potential for serving the most convenient locations in Back Bay, offers the service that have the widest variations in travel times.

Economic Comparison of Service Packages

Operating expenses were calculated for 1975. The estimates for service packages involving buses were based upon a formula for the costs of MBTA bus operations. In this formula, cost is a function of vehicle miles and vehicle hours. For Service Package B, the formula was adjusted slightly to reflect cost savings from high speed operation on the Mass Turnpike. The estimates include the cost of deadheading. Appendix II outlines the methodology used to calculate operating expenses.

Operating expenses for Service Package A were calculated from a formula for Penn Central operations. In this formula, cost is a function train miles and of car miles.

Neither cost formula includes fixed costs associated with bus or rail operations. Each Service Package would have negligible impact on the fixed costs of the MBTA system. These fixed expenses would be necessary regardless of which service package were implemented.

Annual operating expenses for the Service packages are as follows:

Service Package A	\$244,000
Service Package B	\$180,000
Service Package C	\$226,000

Capital Expenditures: Construction Costs

Service Package A:

In order to operate rail shuttle service between South Station and Back Bay, it is necessary to provide a rail crossover at the B & A tracks near Massachusetts Avenue. This will permit shuttle trains to be operated on B & A tracks without interfering with the limited operation of other rail services on the B & A right-of-way (currently four trains daily.) An additional crossover at Back Bay may also be required.

The cost of the Massachusetts Avenue crossover and necessary signalization was estimated by Mr. Paul Frazier of the MBTA to be upwards of \$50,000. The construction of a crossover and signalization might be necessary as part of construction of a South Cove to Forest Hills Relocated Orange Line regardless of the type of shuttle service offered between South Station and Back Bay. The cost of the crossover and signalization may already be included in the cost estimate for Orange Line relocation. It will be assumed for this analysis that these costs are not included inOrange Line relocation estimates and that the costs must be ascribed fully to the provision of Service Package A.

If Back Bay Station cannot be used during the construction phase of the Orange Line Relocation, it will be necessary to construct two low level boarding platforms near Clarendon Street. The cost of two platforms was estimated by the C.T.P.S. Design Section to be \$2,800 at current prices. These platforms would be long enough to accommodate the longest rail shuttles (4 Budd cars) envisioned in Service Package A. The cost of two stairways connecting the boarding platforms to Clarendon Street was also estimated by the C.T.P.S. Design Section. At current prices, the stairways would cost about \$30,000. The cost of two shelters at each platform would be \$40,000.

The total cost of construction necessary to implement Service package A would be somewhere between \$175,000 and \$190,000, if Back Bay Station cannot be used during the construction phase of Orange Line Relocation. For the purposes of this analysis, an estimate of \$190,000 was assumed.

Service Package B:

The construction of a ramp over the Massachusetts Turnpike is necessary in order to provide the service offered in Package B. The ramp would remain in operation until rail service to Back Bay Station is returned to the Stoughton Branch, the Franklin Branch, and the Providence Main Line following the construction phase of Orange Line Relocation from South Cove to Forest Hills.

The ramp would be located over the Massachusetts Turnpike between Dartmouth Street and Huntington Avenue. Fig. D-6 shows the ramp and its relationship to the Turnpike. The ramp allows westbound buses from South Station to return to the Station via the eastbound portion of the Turnpike. The ramp allows westbound buses from South Station to return to the Station via the eastbound portion of the Turnpike. The ramp's design permits bus riders to be picked up and dropped off near Stuart Street and Huntington Avenue.

The Design Section at the Central Transportation Planning Staff estimated the cost of construction of the ramp and analyzed the concept of the ramp for its advantages and disadvantages. The ramp would cost about $1,350,000 to construct at current prices.

Following the construction phase of Orange Line Relocation, operation of buses on the ramp would no longer be necessary. There would be two options for restoring the Turnpike to its original condition and capacity within the vicinity of the ramp. The first option is to dismantle the bridge. The second option is to let the bridge stand, dismantle the elevated eastbound portion of the ramp, and replace the wall and backfill that were removed to construct the westbound portion of the ramp.

The $1,350,000 estimate does not include costs associated with either option. The first option, dismantling the bridge, would probably cost as much as construction of the ramp. It would be as disruptive to Turnpike operations as construction.

The second option would be less disruptive than the first option to Turnpike operations. The second option would cost roughly 30 to 40 percent of the construction cost. It would bring the estimate of capital expenses for Service Package B to between $1,750,000 and $1,900,000. For the purposes of this analysis it will be assumed that construction costs for Service Package B are $1,850,000.

The $1,350,000 estimate does not include the cost of taking or leasing any necessary land. All of this land is owned by the Massachusetts Turnpike Authority. An itemization of the expenditures necessary for construction are shown in Fig. D-8.

Service Package C:

There are no capital expenditures associated with Service Package C.

Capital Expenditures: Rolling Stock Requirements

Service Package A:

The provision of rail shuttle service described in Package A requires 7 Budd cars. These cars would be operated in two trains during the AM and PM peak hours. During much of the day, service could be provided with the operation of a single Budd car.

From discussions with Mr. Thomas Humphrey of EOTC and Messrs. Paul Frazier and Wally Williams of the MBTA, it was concluded that it was possible to obtain Budd cars. AMTRAK will be offering surplus coaches and locomotives for sale or lease in the next several years. Seven coaches could be leased from AMTRAK. A locomotive could be purchased from AMTRAK. The coaches and the locomotive could be operated on B & M tracks. They would replace seven Budd cars currently used on B & M tracks. These Budd cars could then be used to provide rail shuttle service.

The cost of rolling stock for Service Package A is estimated to be about $33,000. This estimate includes the cost of leasing seven coaches from AMTRAK for a four year period and the cost of purchasing one E-8 locomotive. (These are currently sold at very low prices.) Once direct service to Back Bay is resumed, the locomotive could be sold as scrap. The resale value of the locomotive was reduced by the appropriate discount factor and was, then, subtracted from the estimate.

Service Package B:

During the AM and PM peak hours, the operation of eleven buses will be required to provide the service described in Package B. Only one of the buses will operate as a shuttle during the entire day. Some of these buses will make only one trip between South Station and Back Bay during each peak period. These buses could be operated on other MBTA routes during the remainder of the peak period.

In spite of the potential for interlining buses under Service Packages B and C with other MBTA bus services, it is not assumed in this analysis that the buses are used to serve other MBTA routes. Existing MBTA services are already scheduled to form pieces of work. It is assumed that a service package must be viable without the possibility of interline scheduling.

The cost of rolling stock in Service Package B is estimated to be about $409,000. This estimate is based upon the cost of the eleven buses necessary to provide service during the peak hours. The resale value of the buses after four years was reduced to present value and subtracted from the estimate.

Service Package C:

The cost of buses for Service Package C is about $580,000. The procedure for arriving at this estimate is the same as the procedure used to arrive at the cost of buses for Service Package B. The estimate is based upon the cost of the 17 buses necessary to provide service during thepeak hours. The resale value of the buses after four years of service was reduced to present value and subtracted from the estimate. The methodology used to estimate rolling stock expenses is shown in Figures D-9, -10, and -11.

Summary of Capital and Operating Costs. Fig. D-7 compares operating and capital costs associated with each service package. The operating expenses for each service package were converted to their present value (in 1975 dollars). This conversion permits expenses incurred over time, such as annual operating expenses, to be combined with expenses incurred at the onset of service, such as capital costs.

In this analysis, each service package was assumed to be in operation for a four years period. It is estimated that the construction phase of South Cove to Forest Hills Orange Line Relocation will last four years. A discount rate of four percent was assumed in the analysis.

It must be reemphasized that these estimates assume services supplied between South Station and Back Bay that will accommodate the current demand for use of Back Bay Station by riders of Franklin, Stoughton, and Providence trains. The actual demand for the service packages may be considerably less for reasons already discussed.

The costs associated with each service package would be less than those presented in Fig. D-4 if the actual demand were lower than the assumed demand. If service were reduced by proportional amounts for each package, the costs for each package would not decrease proportionately.

Fig. D-4 shows that Service Package B is the most favorable package from the standpoint of operating expenses. Operating expenses for Service Package B are about $170,000 less than operating costs for Package C and about $240,000 less than operating costs for Package A.

Offering Service Package B instead of the other services described results in a savings in operating costs. This savings is more than offset by additional capital expenses associated with Service Package B. The capital expenses for Service Package B exceed capital costs for Package A by over $1,900,000 and for Package C by over $1,500,000. The savings in operating expenses by offering Package B cannot justify the capital expenses associated with that Service Package.

Estimates of expenses for Package A and C are close to one another. Package A is favorable to Package C from a cost Standpoint. Either package is greatly favorable to Package B from the standpoint of total costs.

Provisions to Implement Shuttle Service

Service Package A: Certain steps must be taken to make the implementation of rail shuttle service possible. First, platform space at South Station must be dealt with. In addition, the peaked arrival of commuters at South Station must be considered in any plan to provide rail shuttle service.

Platform space at South Station is the first consideration. There are eight platforms at the Station. During the day, the platforms are used to store trains scheduled for evening rush hour service. There will probably be no free (completely unoccupied) platforms during the day. Shuttle trains would have to load and unload at the ends of the platforms furthest from the South Station terminal.

The platforms are between 600 and 800 feet in length. The act of transferring between shuttles and commuter trains would involve a 3 minute wald, if the shuttles and trains did not occupy sets of tracks that share the same platform. The shortage of platforms would make it difficult to assure that there will be space available to accommodate on the same platform every pair of commuter train and rail shuttle scheduled throughout the day.

Several steps may be taken to alleviate the shortage of platform space. Commuter rail service between Boston and Needham will probably be suspended during the period when shuttle service is anticipated between Back Bay and South Station. This will free up some platform space for shuttle trains. Also, some of the trains stored all day at South Station and scheduled for evening service could be stored on side tracks to the main trackage between South Station and Back Bay. Movable steam generators would have to be installed at the side tracks.

The peaked arrival of rail commuters at South Station in the morning is the second consideration. Between 8:10 and 8:16 AM, three trains arrive at

South Station carrying a total of over 1,000 persons. With the rerouting of Franklin, Stoughton, and Providence trains via the Midland Branch, upwards of 1,500 persons will arrive at South Station within this small time period.

Pedestrian transfer between trains, during this peak, would involve some of the riders who wish to transfer, walking down one platform and up another during this period. At the same time that some riders are walking up the platforms to board the shuttles, other riders will be walking down the platform towards the terminal area. While some congestion will be encountered, the option of rail shuttle service will still result in shorter total travel times than are associated with Service Package B and C.

The simplest solution to the difficulties involved in pedestrian transfer is to allow riders of several of the peak hour trains to continue to Back Bay without having to transfer at South Station. By 1977 or 1978, the MBTA plans to modify some of its trains to allow 'push-pull operations'. This will enable trains to arrive at South Station via the Midland Branch and to continue to Back Bay in reverse. Transfer at South Station to Back Bay would not be necessary. Even before the trains are modified to allow push-pull operations, trains arriving at South Station can be operated in reverse to Back Bay using additional locomotives.

Service Package B: In their analysis of the ramp to be constructed in conjunction with Service Package B, the CTPS Design Section pointed out the deficiencies in the ramp's design. The deficiencies are primarily a result of severe space constraints along the Massachusetts Turnpike right-of-way in the vicinity of Back Bay. These deficiencies are as follows:

(1) Grades on the ramp are very steep. The upgrade (westbound) is about 10 percent. The downgrade (eastbound) is about 11.5 percent. These grades exceed the maximum allowable limits prescribed in the AASHO Handbook (American Association of State Highway Officials, A Policy on Design of Urban Highways and Arterial Streets, Washington, D.C., 1973). Winter road conditions would make bus operations on this ramp hazardous.

(2) The inside turning radius on the bridge is 40 feet, which is very tight. A bus can maneuver the turn, but the design is undesirable.

(3) During construction of the ramp, at least one lane (and sometimes two lanes) of the Mass. Turnpike in each direction would have to be closed. Stuart Street traffic would have to be detoured or limited during construction.

(4) During operation of buses on the ramp, section of the right lane of the Turnpike eastbound would have to be closed. This section would extend from a point west of Huntington Avenue to a point about 400 feet east of Dartmouth Street. It would allow buses using the ramp to accelerate on the eastbound Turnpike without interference from other traffic on the Turnpike.

(5) During operation of buses on the ramp, the entrance to the Turnpike westbound from the Clarendon Street Parking Garage could not be used. The operation of that entrance would interfere with buses decelerating in the right hand lane of the Turnpike westbound to use the ramp.

(6) During one period of construction, the steel beams for the bridge would have to be set in place. At this time, no traffic can be operated on the Turnpike within the vacinity of the ramp. This phase would last one to two weeks.

Service Package C: There are no obstacles to implementing Service Package C.

Conclusions and Recommendations

There are serious disadvantages associated with Service Packages B and C which lead to the conclusion that Service Package A is the best option (of the three) for the South Station to Back Bay shuttle service. Almost all of the strong points held by either Service Package B or C are also held by Service Package A.

Service Package B has the distinct disadvantages of highest total costs and of inference with the Mass. Turnpike during ramp construction and during service operation. Service Package C has as its weak points the longest travel times and poorest potential for schedule adherence. Service Package A has none of these disadvantages. The shortage of platform space is an obstacle to implementing Service Package A. This obstacle is not insurmountable.

Serve Package A has three major strong points. The package offers a high potential for schedule adherence. Travel times associated with the package are relatively low. The service has relatively low costs.

Service Package A is less favorable than Service Package C from the standpoint of convenience of locations served. This must be weighed against the areas where Package A is favorable to Package C - i.e., travel times and schedule adherence. It is the conclusion of this analysis that Service Package A is the best option (of the three) for South Station to Back Bay shuttle service.

II. EXPRESS BUS SERVICE PACKAGES

Two groups of bus routes (service packages) have been developed for use as assumptions in conjunction with Orange Line South alternatives to estimate future demand for these alternatives. This memorandum describes the bus routes and identifies costs, times and fares associated with each service package.

Service Package I: Express Service Between Birds Hill, Needham Center, and Needham Heights and Boston

During the construction phase of the South Cove to Forest Hills Orange Line Relocation and Forest Hills to Needham Transit Improvements commuter rail service could not be operated on the Needham Branch. Commuter rail riders using stations outside of Needham could use existing feeder bus service to the existing Orange Line during construction. No alternative public transportation service currently exists for commuter rail riders using Needham stations. Service Package I was developed as an alternative service that was comparable to commuter rail service to Needham that could be used as an assumption in projecting Orange Line demand during the construction phase.

Service Package I offers express bus service via the Massachusetts Turnpike between Needham and Boston. All bus service in this package would operate in one direction only on a loop serving one stop each at Needham Heights, Needham Center, and Birds Hill station vacinities. Buses would operate on the loop via Highland Avenue, Great Plain Avenue, and Route 128. (See Fig. D-12) Buses from Boston would enter Highland Avenue from Route 128, turn on Great Plain Avenue, and return to Route 128 at the Great Plain Avenue access ramp. Having served the loop, buses would then proceed to Boston via the Mass. Turnpike.

During the morning and evening peak hours, two Boston locations, Copley Square and South Station, would be served separately by express buses to and from Needham. (See Fig. D-13) Service frequencies between Needham and South Station would be greater than frequencies between Needham and Copley Square.

During the remainder of the day, two Boston locations would both be served by the same express buses to and from Needham. A bus from Needham would proceed first to Copley and, then, to South Station. The bus would return to Needham serving, first, South Station, then, Copley Square, and proceeding to Needham via the Mass. Turnpike.

Service Package II: Express Service Between Needham Junction, Needham Center, and Needham Heights and Boston.

The second service package was developed for use as an assumption in conjunction with an assumed relocated Orange Line and a double track railroad or transit extension to Route 128 via the Needham Branch right of way. Throughout the day, express bus service would be offered at three stops in Needham near the Needham Heights, Needham Center, and Needham Junction stations. Buses from Boston would reach Needham via the Mass. Turnpike and Route 128. Buses would leave 128 at the Highland Avenue exit, operate on Highland Avenue and Chestnut Street, dropping off riders at Needham Heights and Needham Center stops, turn around at Needham Junction, serving that stop, operate in the reverse direction on Highland and Chestnut, picking up riders at Needham Center and Needham Heights, and then proceed to Boston. (See Fig. D-12)

As is the case with service assumed in the first package, Service Package II provides that the two Boston locations, South Station and Copley Square, are served separately during the morning and evening peak hours. Peak hour service to South Station is more frequent than service to Copley Square in Service Package II. Off-peak service was found to not be justifiable as a result of demand analysis.

Characteristics of Service Packages and of Current Commuter Rail Service

Demand. For the purpose of determining service frequencies for Service Package I, daily inbound ridership was assumed to be 800. This assumption is consistent with CTPS estimates of 1980 ridership for the 'base case'. In the base case, transit service to be Southwest Corridor is assumed to be the same in 1980 as present service. The base case is a 'no build alternative'. Needham is served in the base case by commuter rail operating at the same frequencies and serving the same stations as present service does.

The CTPS estimates for 1980 inbound ridership boarding at stations in Needham are as follows:

Needham Heights	97
Needham Center	198
Needham Junction	304
Birds Hill	307
	906

Service Package I was designed to provide express bus service to Needham Heights, Needham Center, and Birds Hill that is comparable to present rail service to these three locations. Demand for Service Package I should be less than the CTPS estimate for inbound ridership at the four Needham stations. Express bus in Service Package I does not serve Needham Junction. Commuter rail in the CTPS 'base case' estimates is assumed to serve Needham Junction.

Not all of the 304 base case riders at Needham Junction would abandon public transportation for their autos if Service Package I were offered in lieu of base case rail. The majority of the riders would board at locations near Needham Junction that are served by express bus, i.e., Needham Center and Birds Hill. Hence, the estimate of 800 daily inbound boardings of Service Package I is consistent with CTPS estimates for ridership of transportation alternatives in the Southwest Corridor.

Daily ridership for Service Package II was assumed to be considerably less than ridership on Service Package I, since Service Package II is to be offered in conjunction with a highly competitive transit alternative, double track commuter rail or the Orange Line extended to Route 128. Daily ridership was estimated to be 3000 for Service Package II. This estimate is approximately the same as CTPS estimates of 1980 base case riders who walk to the three stations served by Service Package II.

Service in off-peak hours for Service Package II will not be justifiable unless demand is uniform throughout the day. Normally, demand for transportation is peaked, and demand for public transportation is more severely peaked than demand for auto trips.

To determine peak hour demand for the service packages, a comparison was made of express bus services in the vacinity offered. Fig. D-14 shows peaking characteristics. Ridership on the Needham branch is severely peaked. Ninety-six percent of all inbound trips are made in a three hour peak period. Peaking on an express bus line serving Riverside is even more severely peaked.

Of the markets served by express bus in the MBTA district, the market served by the Riverside bus is the most similar to the market in Needham. Persons living in the areas served by the Riverside express bus and persons living in areas served by commuter rail in Needham have similar tripmaking patterns and have similar socio-economic characteristics. Both areas are about the same distance from downtown Boston. All this information supports the assumption that demand for express bus service offered in Service Package I will be as severely peaked as the present demand for rail service in Needham.

Fig. D-14 also shows that within the peak period demand is distributed more evenly for express bus service than for rail service. Peak hour express bus inbound ridership represents, at most, fifty-seven percent of the peak period inbound ridership. Eighty-four percent of Needham's inbound peak period rial trips occur within one hour. This is because three of Needham's five peak period trains leave within one hour. Bus Service requires more departures than rail service to provide equivalent overall, line capacities. These departures are more evenly distributed throughout the peak period than the distribution of rail departures are. This information supports the assumption that peak period inbound ridership for Service Package I would be more evenly distributed than current ridership for commuter rail.

The double track commuter rail or Orange Line extension to Route 128 will capture larger shares of transit ridership during off peak hours than during peak hours, if express bus service is offered throughout the day. As a result, the peaking characteristics of ridership for Service Package II will be similar to characteristics of current commuter rail ridership. The small percentage of off-peak ridership shown for commuter rail in Fig. D-14 supports a conclusion that express bus service would not capture sufficient ridership to be justifiable in off-peak demand more effectively than express bus service to Boston would.

Service Frequency and Capacity. Any express bus service designed to be comparable to Needham's rail service must offer higher frequencies to the major downtown destination, because the capacity of the train serving the Needham Branch greatly exceeds the capacity of an express bus. Fig. D-15 compares service frequencies (in terms of inbound departures), seated capacities, and demand for the two Service Package and for the currently offered rail service. For Service Package I, Copley and South Station are served separately in the peak period and are on the same route during the remainder of the day. Daily departures and capacities shown for express bus packages in Fig. D-15 are to either Copley or South Station. For Service Package I, 30 buses leave Needham daily. South Station is served by 27 of these buses, and Copley is served by 9 of these buses.

All departures and capacities shown in Fig. D-15 for rail service are for either South Station or Copley. Both destinations are served by each departure by rail. Seated capacity for rail during the peak hour greatly exceeds Needham demand. The additional capacity for rail is necessary to accommodate riders boarding at stations outside of Needham.

Both Service Packages have the capacity to serve estimated demand. Service Package I offers more frequent service than current rail service in order to provide line capacity equal to the line capacity offered by rail.

Travel Times. Fig. D-16 compares travel times of two service packages and current rail service to Needham. Fig. D-17 presents this data in the form of a mock schedule. With a few exceptions, scheduled travel times by rail are similar to travel times estimated for the two service packages.

Fares. At the time of writing this memorandum, rail fares to Needham are as follows:

Between South Station (or Copley) and -	One Way Fare
Birds Hill	$1.20
Needham Junction	1.25
Needham Center	1.30
Needham Heights	1.35

It is consistent with the MBTA Fare Review Task Force recommendations for changes in express fares for 1976 to assume that an express bus service to Needham would have a minimum of $1.00 and possibly $1.25 one way fare.

At the time of writing this memorandum, changes in the fare structure are being studied by the MBTA. These changes are being made to achieve greater consistency between fares charged and transit services provided throughout the MBTA District. It is impossible to predict what discounts would be available to commuters using express bus or what commuter rail fare structure will be in effect at the time assumed for implementation of express bus service packages.

Costs. Based upon 1973 and 1974 MBTA bus costs with adjustments more efficient fuel consumption associated with express service and for a ten percent increase in costs annually, costs of Service Packages I and II are, respectively, $760,000 and $325,000 in 1976. Cost of service minus revenues for 1976 for Service Package I is $315,000 if one way fares are $1.00 and $205,000 is one way fares are $1.25. Cost of service minus revenues for 1976 for Service Package II is $170,000 if one way fares are $1.00 and $130,000 if one way fares are $1.25.

III. OPTIONS FOR BUS SERVICE BETWEEN BOSTON AND ROSLINDALE/WEST ROXBURY

The various options for bus service between Boston and Roslindale/West Roxbury are shown in Fig. D-18.

Option One - Provide additional capacity on the feeder bus route to Forest Hills Station.

At present, four Needham Branch Stations are served by a single feeder bus route, Route 37, to Forest Hills Station. The attached map shows the alignment of Route 37. Recent ridership counts for Route 37 show that during the peak hour, buses serving the route operate in excess of seated capacity. It is estimated that the operation of eleven additional buses in the morning and evening rush hours would provide enough extra seated capacity to accomodate users of the Needham Branch Stations.

Travel times to downtown Boston (South Station) by the Needham Branch and by feeder bus to the Orange Line are compared in Table I. Waiting time at the Forest Hills Station was estimated to be 2 minutes for the purposes of calculating the travel times.

Fig. D-19 shows that more travel time is necessary to reach Boston via feeder bus than via commuter rail from the four station areas. A loss in transit use would typically be expected as a result of this increase in travel time. This loss is offset by an increase in the use of Route 37 due to improved service frequencies. Trains on the Needham Branch have a 20 minute frequency during the peak hour. Buses on the Route 37 would have 4 minute frequencies during the peak hour.

Option Two - Provide express bus service to Back Bay and additional capacity on the feeder bus route to Forest Hills Station.

Option Two was developed to meet the deficiency of Option One - poor service to Back Bay. It is estimated that over forty percent of the Needham Branch riders travelling to Boston use the Back Bay Station. Under Option Two, an express bus service from the West Roxbury-Roslindale area to Copley Square would be operated during the morning and evening peak periods. The route to Copley would be via South Street, Walter Street, Centre Street, Arborway, Parkman Drive, Perkins Street, Centre Street, Columbus Avenue, and Dartmouth Street. A permit would be necessary for buses to operate on these streets.

During the morning hours, inbound buses would pick up riders at two locations, one near Highland Station and the other near Roslindale Station. The buses would then proceed to Copley Square as an express service. There would be nine buses to Copley Square during a three hour period in the morning. Five of the nine departures from West Roxbury/Roslindale to Boston would occur during the peak hour. There would be outbound service with similar frequencies during the evening peak period.

Travel times to Back Bay would be longer on the express bus than they are currently on the Needham Branch. It takes 21 minutes to reach Back Bay Station from Highland Station via rail. Express bus travel times would probably be between 36 and 43 minutes. Rough estimates of demand for the express service show that about ten percent of the Needham Branch riders using Back Bay would not use the express bus to Back Bay, because of this increase in travel time.

In addition to the express bus service, Option Two provides for extra buses to serve Route 37 during the morning and evening peak hours. It is estimated that six round trips in each peak hour could accomodate the Needham Branch riders not wishing to go to Back Bay.

Option Three - Provide express minibus service to Back Bay and additional capacity on the feeder bus route to Forest Hills Station.

Option Three is similar to Option Two. Both options offer express service and additional feeder service. The express option in Option Three is distinguished from the service in Option Two by three characteristics. First, minibuses would be used in Option Threee. Regular 46 seat buses would be used in Option Two. Second, frequency for Option Three would be greater than the frequency offered in Option Two. The minibus has less capacity than a standard bus. Higher frequencies are necessary to serve the express bus route with minibuses. Third, the express bus route is essentially the same in both options. The minibus has a lower turning radius than the standard bus. This permits the minibus to use Pond Street and the Jamaicaway around Jamaica Pond instead of Parkman Drive and Perkins. (See attached map for minibus deviation in the express route).

Under Option Three, hours of operation and travel times are the same as in Option Two. During the morning peak period, there are 13 departues to Boston under Option Three. During the morning peak hour, nine of these departures are made. Similar service is offered during the evening peak period.

Rough estimates show that five percent of the ridership to Back Bay via the Needham Branch would not use express bus service offered in Option Three. This group would not use the bus service because of the difference in travel times to Back Bay between rail and express bus. Ten percent of the Needham Branch riders using Back Bay will not use the express bus service in Option Two. Option Three is more attractive because it offers more frequent express service.

In addition to the express bus service, Option Three provides for extra buses to serve Route 37 during the morning and evening peak hours. It is estimated that six round trips in each peak hour could accomodate the Needham Branch riders not wishing to go to Back Bay.

IV. PROCEDURE USED TO DETERMINE OPERATING COSTS AND REVENUE FOR NEEDHAM EXPRESS BUS, COMMUTER RAIL AND WEST ROXBURY/ROSLINDALE OPTIONS

Operating Expenses

Commuter Rail -

Operating expenses for commuter rail are based upon a study of fixed and variable costs of rail service in the Boston region by Penn Central. The costs are for 1975 operations and are in 1975 dollars. They do not reflect recently implemented improvements in administration of commuter rail in the region. Variable cost of rail service were isolated for this table by Thomas Humphrey of EOTC.

Commuter rail operating expenses include an estimate of the cost of upgrading three streches of the Needham Branch to allow speeds of 30 miles per hour. The cost estimate represents only a small portion of the annual costs of operations (seven tenths of one percent). It assumes that upgrading requires tie renewal only. Costs are amortized over a two year period.

Fixed costs of rail service that would continue to be expenses, if service were suspended on the Needham Branch, are not included in the operating expenses estimate. These fixed costs include the expenses associated with the operation and maintenance of South Station and Back Bay Station. The cost of maintaining track and signals on the portion of the track shared by trains operating on the Needham, Franklin, and Stoughton Branches is also treated as a fixed cost. The cost of operating switches behind South Station is assumed to be a fixed expense.

Needham Express Bus -

Operating expenses for express bus service are calculated from a cost formula that is based upon 1974 MBTA variable expenses for bus operations. In the formula, costs are a function of vehicle hours and vehicle miles operated. Cost per vehicle mile for express bus operations is assumed to differ slightly from cost per vehicle mile of local bus operations. Buses operating express use less fuel per mile than buses operating on local routes. The model was adjusted to reflect better fuel economies associated with express bus service. Costs were factored to reflect higher operating expenses in 1975.

West Roxbury/Roslindale Options -

The different options are described in a separate memorandum. For each option, operating expenses were calculated in 1974 dollars from a formula basis upon variable expenses for MBTA bus operations. Costs per vehicle mile for minibus operations was assumed to differ slightly from the cost of vehicle mile of standard equipment. Minibuses use less fuel per mile than standard equipment.

Cost per vehicle mile of standard equipment operating 'express' in these options was assumed to be the same as the cost of local service. Commercial speeds on the 'express' service in these options are

lower than speeds on MBTA express services using limited access highways. The commercial speeds are close to local service speeds.

Costs are adjusted to reflect higher operating expenses in 1975.

Revenue

Commuter Rail -

The revenue estimate was based upon reports of 1974 system-wide revenue for Penn Central commuter services. System-wide revenues were disaggregated for the Needham Branch. This estimate of 1974 revenue was factores to reflect the change in ridership between 1974 and 1975 on the Needham Branch.

Needham Express Bus -

The revenue estimates for express bus are based upon demand projections for 1976 for service between Boston and Needham. The demand forecasts are discussed in a CTPS report entitled, "Express Bus Service Packages." The first revenue estimate on the cost and revenue tables assumes a fare of $1.00 per trip on express service. The second estimate on the table assumes $1.25 per trip. Revenue for 1976 was calculated from the demand estimates and fare assumptions.

West Roxbury/Roslindale Options -

The revenue estimate for these options is based upon a projection of rail ridership in 1976 for users of the station within the vicinity of the feeder bus route. A fare of fifty cents (twenty-fice cents for bus plus twenty-five cents for the Orange Line) per trip was assumed for 1976. Revenue for 1976 was calculated from the demand estimates and fare assumptions.

Revenue estimates for each option differ. This reflects differences in travel times and frequencies associated with each option.

Capital Expenses

Commuter Rail -

No capital expenses were assumed for commuter rail.

Needham Express Bus -

The cost of all buses necessary to provide service during the peak hour was the basis for this estimate. The resale value of the buses after a four year period was reduced to present value and substracted from the cost of the buses. The estimate was amortized over a four-year period. It was assumed that the buses were not interlined with other MBTA services.

West Roxbury/Roslindale Options -

The methodology used here is consistent with the methodology used to calculate Needham Express Bus Service.

Details To The Cost Estimate
For Rail Service On The
Needham Branch

Expenses

Costs are in 1975 dollars. This estimate is for the cost to provide service at current levels on the Needham Branch. The estimate is based on a forecast made by Penn Central in December 1974 of the costs to provide commuter service on the Penn Central lines in 1975. The forecast did not disaggregate the cost of serving each branch. Mr. Thomas Humphrey of EOTC estimated the share of the total costs of Penn Central service that can be ascribed to Needham Branch service. These costs fall into the categories listed below:

1. Costs varying with amount of service on the Needham Branch -

Item	Disaggregated by		Amount
Stationery	Riders	$	2,357
Crew Cost	Car miles		489,950
Maintenance			
Loco	Loco miles		41,553
Coaches	Coach miles		121,117
RDC	RDC miles		86,901
Fuel			
Loco	Loco miles		32,929
RDC	RDC miles		18,501
Total		$	793,308

2. Fixed costs of service on the Needham Branch - It is assumed that 50% of fixed cost would be eliminated, if there were no service on Needham Branch

Item	Disaggregated by		Amount
Line and System	Train miles	$	554,229
South Station	(Penn Central est.)		234,727
Ticket office	Riders		22,876
Administration	Train mile		21,180
Total Fixed Cost		$	833,012

3. Cost of improving 3 streches of track now sub-standard on Needham Branch

	$	11,100

Total expenses in 1975 dollars

Variable Cost	$	793,308
+ 50% Fixed Cost		416,506
+ Improving substandard streches		11,100
Total Cost	$	1,217,314

Revenue

1975 Revenue on the Needham Branch was estimated to be $529,029. This estimate is based upon reports of 1974 system-wide revenue for Penn Central commuter service. System-wide revenues were disaggregated for the Needham Branch revenues. This estimate of 1974 revenue was factores to reflect the change in ridership between 1974 and 1975 on the Needham Branch.

Annual Cost of Needham Branch Service

Expenses	$ 1,217,314
Revenue	529,029
Expenses minus Revenue	625,285

Details To The Cost Estimate
For Express Bus
Service Between Needham
And Boston

Operating Expenses

Platform costs in 1974 dollars

16,860	vehicle hours annually
x 12.14	dollars per vehicle hour
$ 204,681	for platform costs

Movement costs in 1974 dollars

485,200	vehicle miles annually
x 0.8777	dollars per vehicle mile (express bus)
$ 425,860	for movement cost
630,541	total operating expenses in 1974 dollars
x 1.115	factor to estimate 1975 expense
$ 703,053	total operating expense in 1975 dollars

Capital Expenses

Cost per bus -

Assumes 4% discount rate
Assumes depreciation of $7,000 per year
Assumes $70,000 to be cost of new bus

Resale value is about $36,000 in current dollars

$ 7,000	per year depreciation
x 4	year period of operation
$ 28,000	depreciation
$ 70,000	cost of new bus
- $ 28,000	depreciation
$ 42,000	resale value in future dollars
x 0.855	factor to reduce future value to
$ 35,910	present value of $42,000

Cost of bus is $34,000 ($70,000 minus resale value)

Annual cost is

$ 34,000	
x .276	factor for 4 annual payments
$ 9,384	annual cost per bus

Cost for 13 buses

$ 9,384	annual cost per bus
x 13	buses
$ 121,992	annual cost for 13 buses

Revenue

At $ 1.00 per trip -

800	riders per weekday (one way)
x 5	days per week
4,000	riders (weekday) per week
+ 250	riders per weekend
4,250	riders per week
x 52	weeks per year
221,000	riders per year
x 2	trips per rider
442,000	trips per year
x $ 1.00	per trip
$ 442,000	revenue per year in 1975 dollars

At $ 1.25 per trip

442,000	trips per year
x $ 1.25	per trip
$ 552,500	revenue per year in 1975 dollars

Details To Cost Estimates
For Bus Service Between
Boston And West Roxbury/Roslindale

Option One - Feeder Service Provide Additional Capacity to Route 37 in the Rush Hours

Operating Expenses

.8	vehicle hours per round trip
x 11	round trips per peak
8.8	vehicle hours per peak
x 2	peaks per day
17.6	vehicle hours per day
x 269	days per year
4576	vehicle hours per year
X $12.14	per vehicle hour (1974 dollars)
$ 55,553	annually for platform costs

4.6	vehicle miles per trip
x 2	trips per round trip
9.2	vehicle miles per round trip
x 11	trips per peak
101.2	vehicle miles per peak
x 2	peaks per day
202.4	vehicle miles per day
x 260	days per year
52,624	vehicle miles per year
x $0.0961	per vehicle mile (1974 dollars)
$ 47,683	annually for movement costs
$103,236	total operating expense per year in 1974 dollars
x 1.115	factor to estimate 1975 expenses
$115,108	per year in 1975 dollars

Revenue

6,200	trips per week
x 52	weeks per year
322,400	weeks per year
x 0.50	per trip
$161,200	per year

Capital Expenses

Cost per bus is estimated to be $9,384 per year with amortization over a four year period, as previously elaborated.

$ 9,384	annually per year
x 11	buses
$103,224	annually for buses

Option Two - Express Bus Service Between Boston And West Roxbury/Roslindale And Additional Capacity On Route 37 in Rush Hours.

Operating Expenses

Express Bus

Assumes 9 round trips per peak period
Assumes 94 minute round trip time
Assumes 10 mile per hour speed

1.6	vehicle hours per round trip
x 9	round trips per peak
14.4	vehicle hours per peak
x 2	peaks per day
28.8	vehicle hours per day
x 260	days per year
7,488	vehicle hours per year

7,488	vehicle hours per year
x $12.14	per vehicle hour (1974 dollars)
$90,094	annually for platform costs

7.14	vehicle miles per trip
x 2	trips per round trip
14.28	vehicle miles per round trip
x 9	round trips per peak period
128.5	vehicle miles per peak period
x 2	peaks per day
257	vehicle miles per day
x 260	days per year
66,820	vehicle miles per year
x $0.9061	per vehicle mile (1974 dollars)
$ 60,546	anually for movement costs
$151,450	total operating expenses for express service in 1974 dollars
x 1.115	factor to estimate 1975 dollars
$168,867	per year in 1975 dollars

Additional Service on Route 37

Assumes 6 round trips per peak
Option One assumed 11 round trips per peak
Cost of service on Route 37 is estimated to be $62,786

$115,108 x (6/11) = $62,786

Revenue

Assumes ten percent ridership loss on trips to Back Bay due to travel time increase

6,000	trips per week
x 52	weeks per year
312,000	trips per year
x $0.50	per trip
$156,000	per year

Capital Expenses

See previous section for an elaboration of the $9,384 per bus estimate.

$ 9,384	annually per bus
x 12	buses (6 on express and 6 on Route 37)
$112,608	per year

Option Three - Express Bus Service Between Boston and West Roxbury/ Roslindale Using Mini Bus Equipment And Additional Capacity On Route 37 in Rush Hours.

Operating Expenses

Express Bus

1.6	vehicle hours per trip
x 13	round trips per peak
20.8	vehicle hours per peak
x 2	peaks per day
41.6	vehicle hours per day
x 260	days per year
10,816	vehicle hours per year
x $12.14	per vehicle hour (1974 dollars)
$131,306	annually for platform costs

7.4	vehicle miles per trip
x 2	trips per round trip
14.28	vehicle miles per round trip
x 13	round trips per peak period
185.64	vehicle miles per peak period
x 2	peaks per day
371.28	vehicle miles per day
x 260	days per year
96,532	vehicle miles per year
x $0.874	per vehicle mile (1974 dollars)
$ 84,370	annually for movement costs

$215,676	total operating expense for express minibud service in 1974 dollars
x 1.115	factor to estimate 1975 dollars
$240,479	per year in 1975 dollars

Additional Service on Route 37

Assumes 6 round trips per peak
Option One assumed 11 round trips per peak
Cost of service on Route 37 is estimated to be $62,786

$115,108 x (6/ii) = $62,782

Revenue

Assumes five percent ridership loss on trips to Back Bay due to travel time increase

6,100	trips per week
x 52	weeks per year
317,200	trips per year
x $0.50	per trip
$158,600	per year

Capital Expenses

Minibuses

Assumes operation of Twin Coach TC-25 or similar minibuses
Assumes 4% discount rate
Assumes $50,000 purchase price
Assumes depreciation of $5,000 per year

Resale value is about $26,000 in current dollars

$ 5,000	per year depreciation
x 4	years
$ 20,000	depreciation

$ 50,000	cost of new bus
- 20,000	depreciation
$ 30,000	resale value in future dollars
x 0.855	factor to reduce future value to present
$ 25,650	present value of $30,000

Cost of bus is $24,350 ($50,000 minus resale)

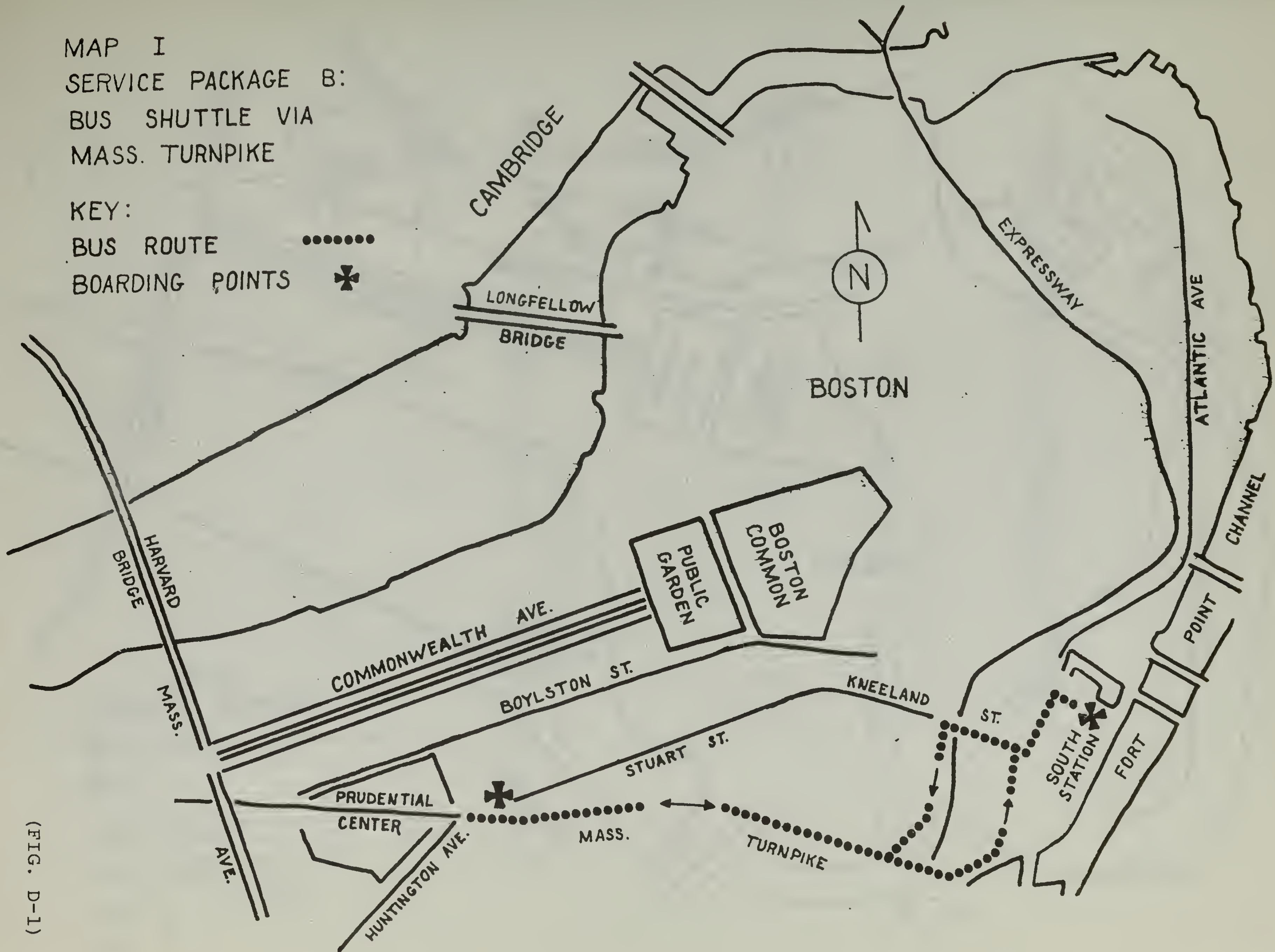
Annual cost is

$ 24,350	cost of minibus
x .276	factor for 4 annual payments
$ 6,721	per minibus per year
x 10	minibus
$ 67,210	per year

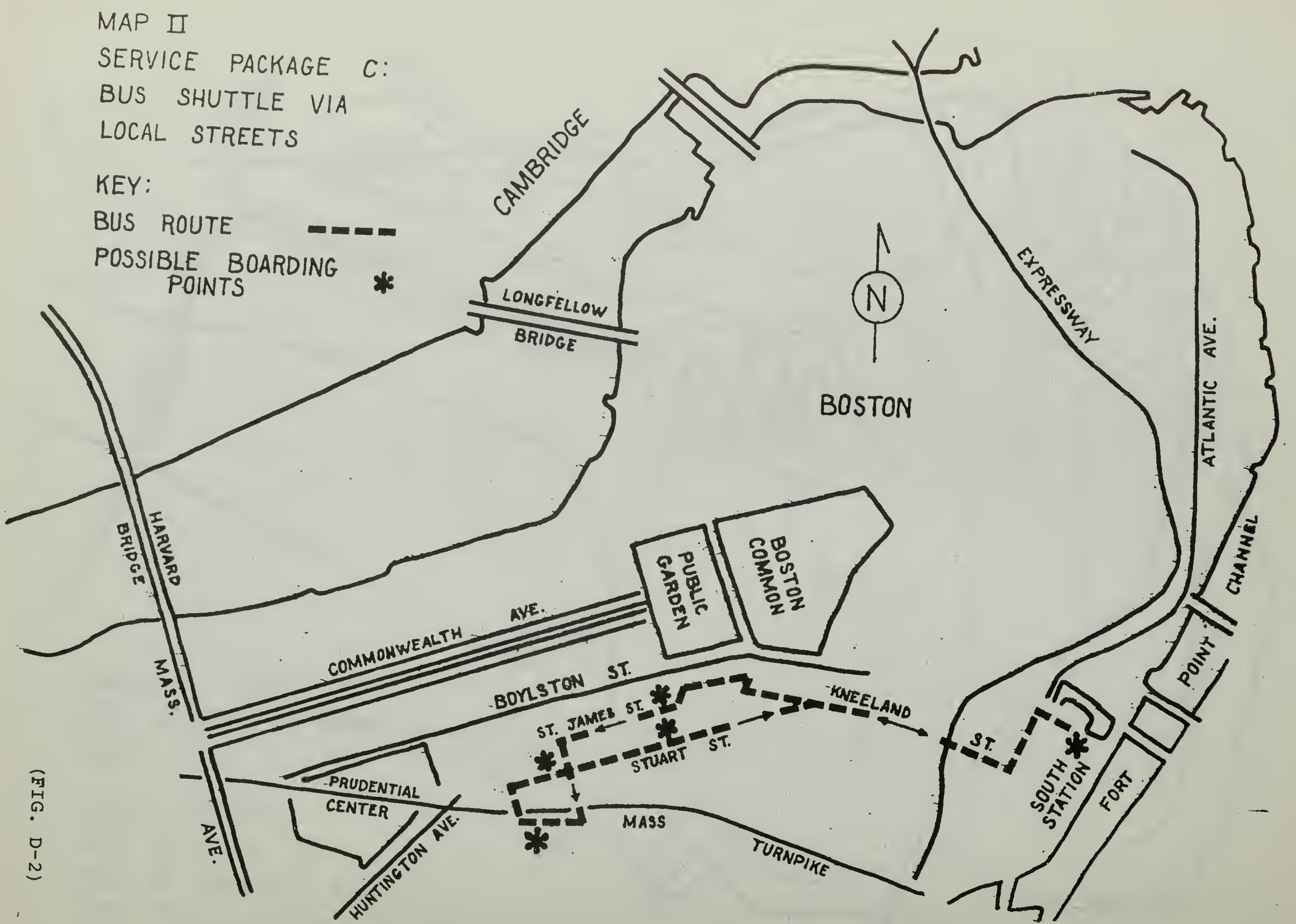
Buses for Route 37

$ 9,384	annually per bus
x 6	buses
$ 56,304	per year

Total cost of buses is $123,514 annually


MAP I
SERVICE PACKAGE B:
BUS SHUTTLE VIA
MASS. TURNPIKE
KEY:
BUS ROUTE
BOARDING POINTS
CAMBRIDGE
LONGFELLOW
BRIDGE
BOSTON
EXPRESSWAY
ATLANTIC AVE
CHANNEL
POINT
FORT
HARVARD
BRIDGE
MASS.
AVE.
COMMONWEALTH AVE.
PUBLIC
GARDEN
BOSTON
COMMON
BOYLSTON ST.
KNEELAND
ST.
STUART ST.
SOUTH
STATION
PRUDENTIAL
CENTER
HUNTINGTON AVE.
MASS.
TURNPIKE

(FIG. D-1)


MAP II
SERVICE PACKAGE C:
BUS SHUTTLE VIA
LOCAL STREETS
KEY:
BUS ROUTE
POSSIBLE BOARDING POINTS *
CAMBRIDGE
LONGFELLOW
BRIDGE
BOSTON
EXPRESSWAY
ATLANTIC AVE.
CHANNEL
HARVARD
BRIDGE
PUBLIC GARDEN
BOSTON COMMON
COMMONWEALTH AVE.
MASS.
AVE.
BOYLSTON ST.
ST. JAMES ST.
KNEELAND
ST.
STUART ST.
PRUDENTIAL
CENTER
HUNTINGTON AVE.
MASS
TURNPIKE
SOUTH STATION
POINT
FORT

(FIG. D-2)

(FIG. D-3)

SERVICE FREQUENCIES AND CAPACITIES FOR TRANSIT BETWEEN BACK BAY AND SOUTH STATION

Service Package A

		Demand	Commuter Trains Met	Shuttle Trains Departing	Seated Capacity
To	Back Bay				
	AM Peak Hour	770	4	4	1,260
	AM Peak Period	1,060	10	10	2,250
	Daily	1,140	15	15	2,700
From	Back Bay				
	PM Peak Hour	670	4	4	990
	PM Peak Period	960	7	7	1,350
	Daily	1,100	12	12	1,800

Service Package B & C

		Demand	Commuter Trains Met	Shuttle Trains Departing	Seated Capacity
TO	Back Bay				
	AM Peak Hour	770	6	16	800
	AM Peak Period	1,060	12	25	1,250
	Daily	1,140	17	30	1,500
FROM	Back Bay				
	PM Peak Hour	670	6	15	750
	PM Peak Period	960	10	21	1,050
	Daily	1,100	17	27	1,350

(FIG. D-4)

TRAVEL TIMES ASSOCIATED WITH SERVICE PACKAGES

	To Back Bay From South Station	To South Station From Back Bay
Service Package A	6 minutes	6 minutes
Service Package B	6 minutes	6 minutes
Service Package C	16 minutes	16 minutes

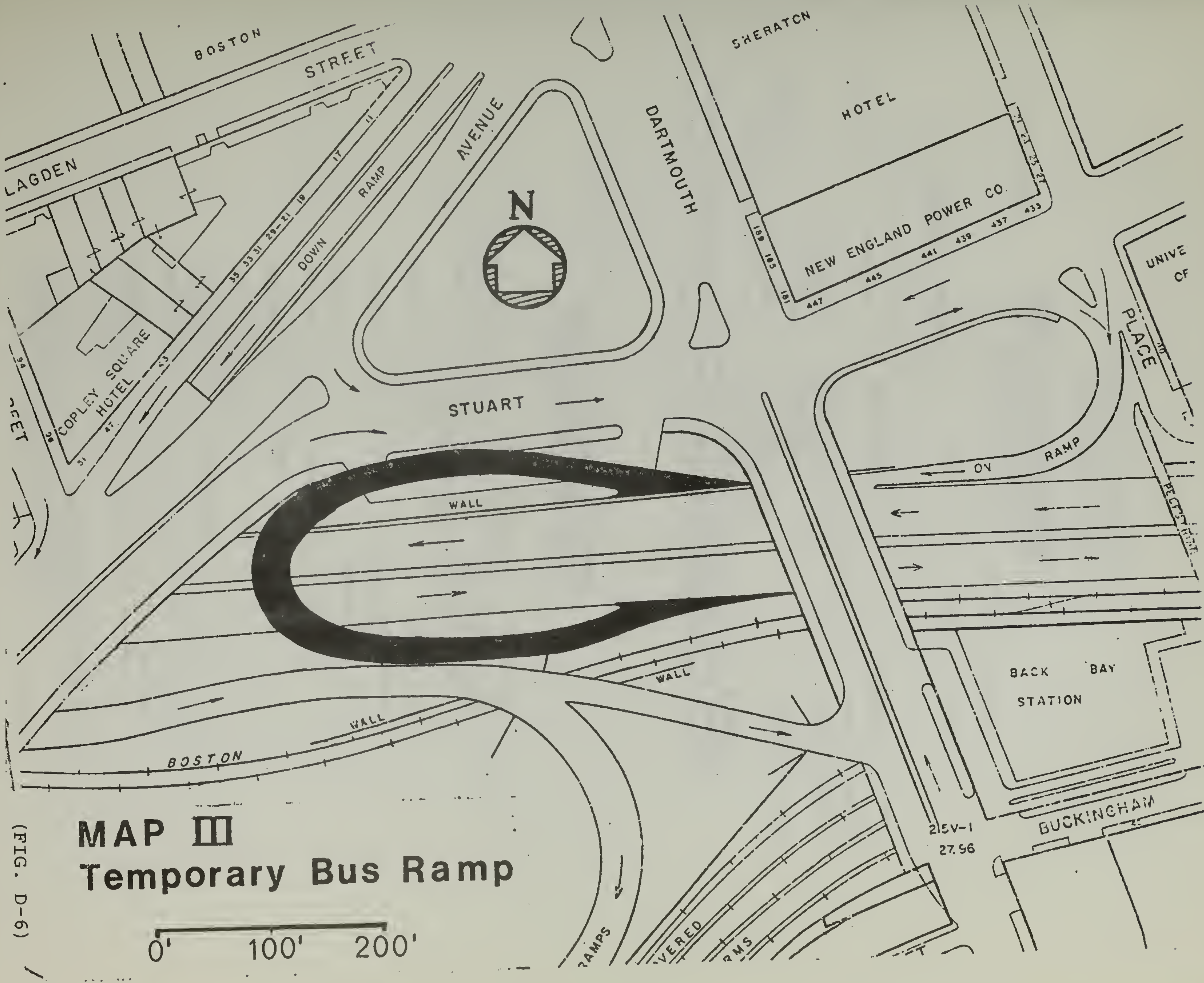
(FIG. D-5)

RANKING OF SERVICE PACKAGES FROM CONVENIENCE AND RELIABILITY AT END POINTS

	SERVICE PACKAGES		
	A	B	C
Schedule Adherence	1	2	3
Walk time between trains and shuttle	1	2	2
Waiting time between trains and shuttle	2	1	1
Convenience of Back Bay locations served	3	2	1

1 = highest ranking (most favorable of the packages)

3 = lowest ranking (least favorable of the packages)



MAP III
Temporary Bus Ramp

(FIG. D-6)

(FIG. D-7)

TOTAL COST IN 1975 DOLLARS
FOR SOUTH STATION TO BACK BAY
SERVICE PACKAGES

	SERVICE PACKAGES		
	A	B	C
Operating Expenses[1]	$ 921,000	$ 681,000	$ 852,000
Capital Expenses			
Construction	190,000	1,850,000	-
Rolling Stock	33,000	409,000	580,000
Total Expenses	$1,144,000	$2,940,000	$1,432,000

[1] Assumes a 4 percent discount rate. Operating expenses are the total expenses for providing service over a four year period (the duration of the construction phase of Orange Line Relocation.)

(FIG. D-8)

SUMMARY OF CONSTRUCTION COSTS
FOR RAMP OVER MASS. TURNPIKE

Excavation & Earthwork		$ 200,000
Roadway Material (mix, concrete, edging, etc.)		210,000
New Bridge		355,000
Viaduct Section		210,000
Safety Controls		40,000
	Sub Total	$1,015,000
	Misc. 20%	203,000
		$1,218,000
	Const. Eng + 10%	121,800
		$1,339,800
Shelter		20,000
		$1,359,000

Approx. $1.35 million
x .30 to .40 to dismantle ramps to bridge

Approx. $1.75 to 1.90 million

(FIG. D-9)

DETAILS OF EXPENSES FOR
SERVICE PACKAGE A -
RAIL SHUTTLE SERVICE

Operating Expenses

1975 Cost Model: $5.21/train mile - indirect cost
$2.75/RDC mile - crew, fuel, and maintenance

Round trip distance - South Station to Mass. Avenue and return is 3.92 miles

Daily Round Trip Cost: 22 trains per day
x 3.92 miles

86.24 train miles per day
x $ 5.21/train mile

$449.31/day

Daily Car Mile Cost: 45 cars per day
x 3.92 miles

176.4 car miles per day
x $ 2.75 per car mile

$485.10 per day

Total daily cost of 22 shuttle trains is

$934.41 per day
x 261 days per year

$243,881 per year

4 annual payments of $1.00 have a present value of 3.775. Discount rate assumed to be 4 percent.

$243,881 per year
x 3.775

$920,651 over four year period

Rolling Stock

7 coaches
x $100 per month

$700 per month
x 48 month

$33,600
x 0.9375 factor for present value of 4 year

$31,500 stream of costs
$ 7,500 estimated cost of E-8 locomotive

$39,000
$ 6,400 present value of saluage value for E-8

$32,600 cost of rolling stock

(FIG. D-10)

DETAILS OF EXPENSES FOR
SERVICE PACKAGE B -
EXPRESS BUS SHUTTLE

Operating Expenses

Deadheading allowance of 5 miles and 30 minutes per bus.

Movement costs

254.1	vehicle miles per day
x $ 1.00	per vehicle mile for express service
$254.1	per day for express service in 1975 dollars

Platform costs

32.36	vehicle hours per day
x $ 13.55	per vehicle hour
$437.1	per day

Total daily cost in 1975 dollars is $691.2

$ 691.2	per day
x 261	days per year
$180,403	per year
x 3.775	factor for present value of 4 year stream
$681,021	

Rolling Stock Costs

Assumes no interlining with other MBTA services.
Assumes 4% discount rate
Assumes depreciation of $7,000 per year
Assumes $70,000 to be cost of new bus

Resale value is about $36,000 in current dollars

$ 7,000	per year depreciation
x 4	year period of oepration
$28,000	depreciation

$70,000	cost of new bus
- 28,000	depreciation
$42,000	resale value in future dollars
x 0.855	factor to reduce future value to present value of $42,000
$35,910	

Cost of bus is $34,090 ($70,000 minus resale value)

$34,090	per bus
x 12	buses
$409,080	cost of buses

(FIG. D-11)

DETAILS OF EXPENSES FOR
SERVICE PACKAGE C -
LOCAL BUS SHUTTLE

Operating Expenses

Deadheading allowance of 5 miles and 30 minutes per bus

Movement costs

	253.7	vehicle miles per day
x	$ 1.01	per vehicle mile for local service
	$256.2	per day for local service in 1975 dollars

Platform costs

	44.9	vehicle hours per day
x	$13.55	per vehicle hour
	$608.4	per day

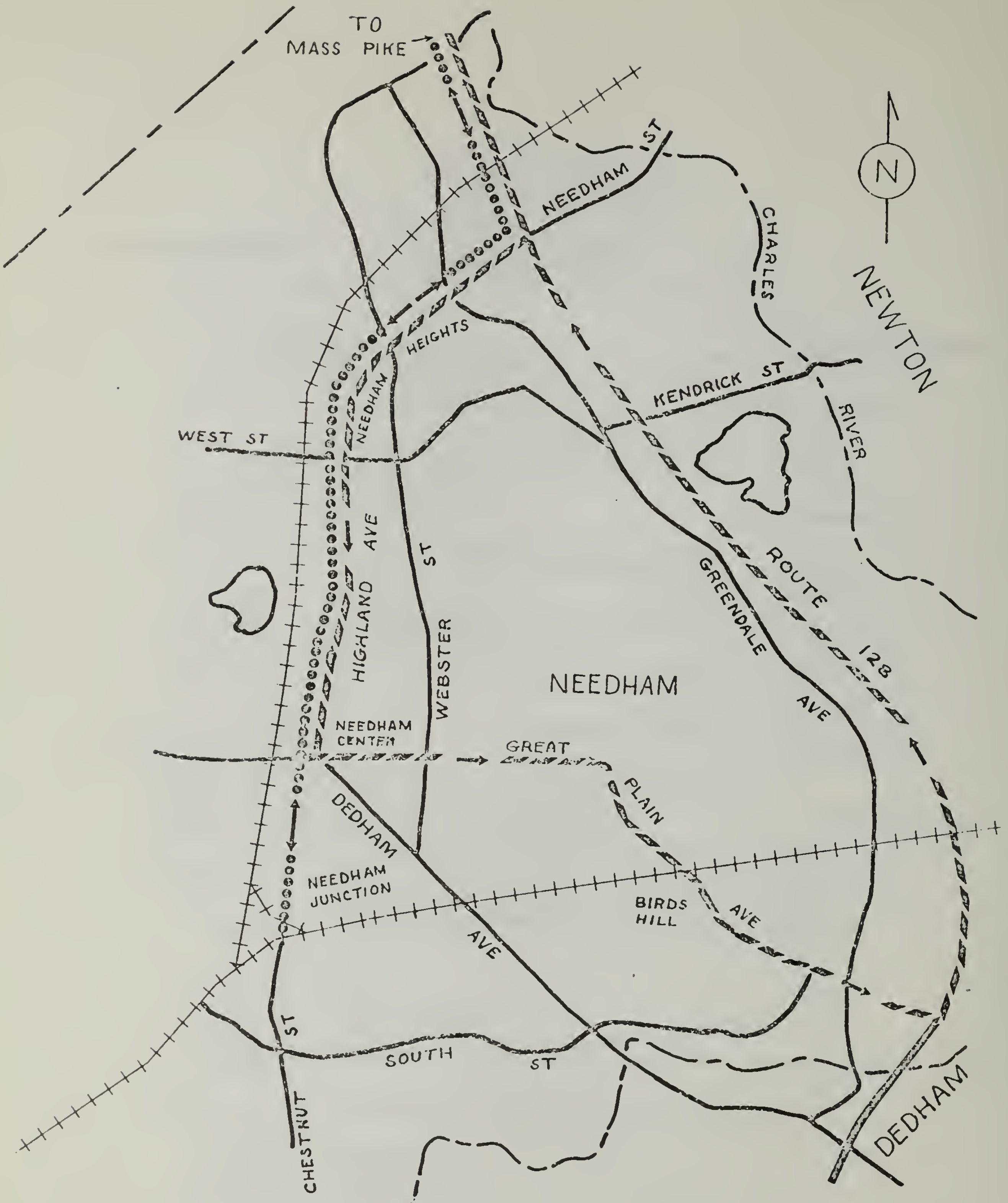
Total daily cost in 1975 dollars is $864.60

	$ 864.60	per day
x	261	days per year
	$225,661	per year
x	3.775	factor for present value of 4 year stream
	$851,870	

Rolling Stock

See details for Service Package B for assumptions

	$ 34,090	per bus
x	17	buses
	$579,530	for rolling stock

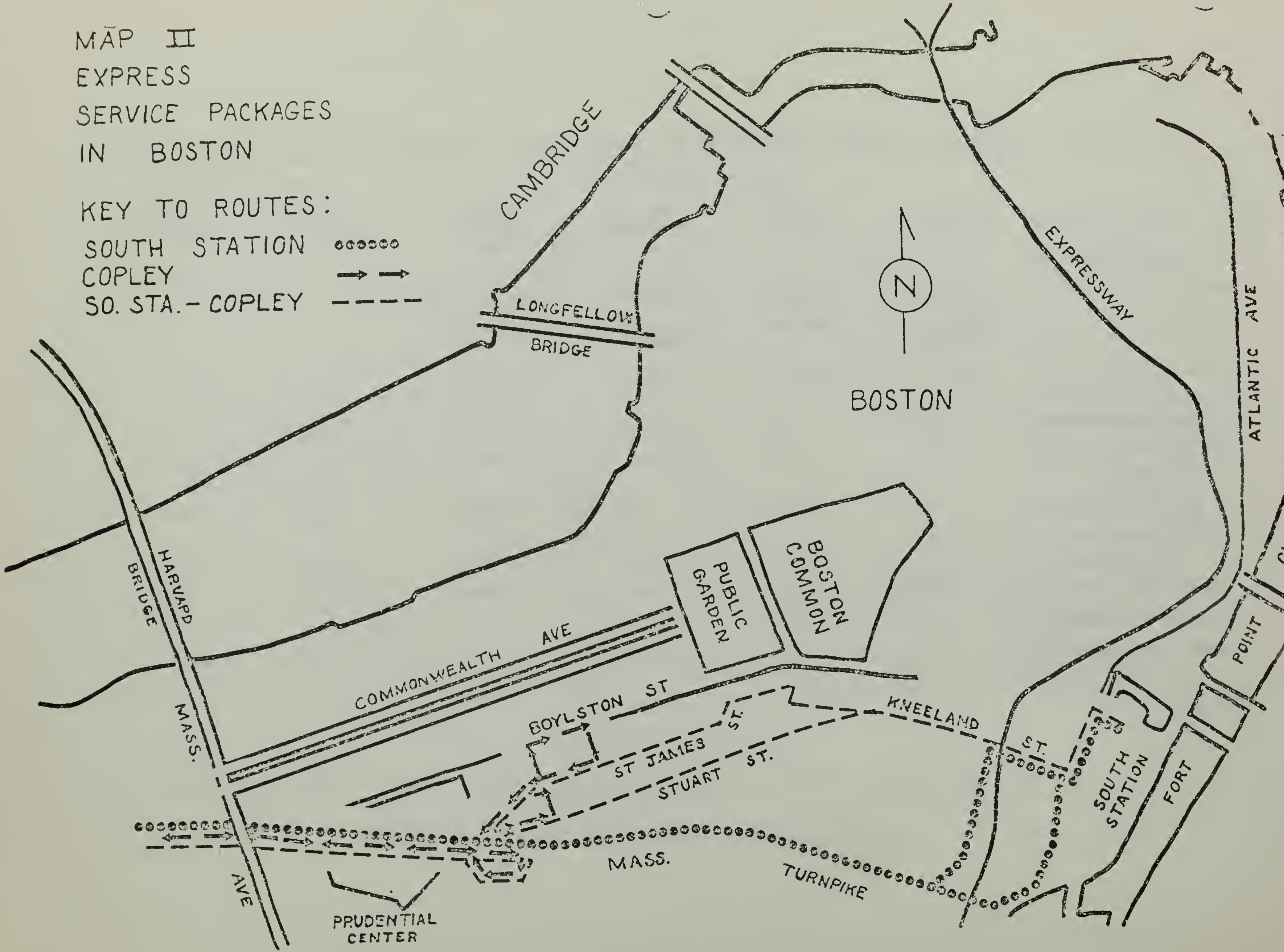


SERVICE PACKAGE I

SERVICE PACKAGE II

MAP I
EXPRESS BUS
SERVICE PACKAGES
IN NEEDHAM

(FIG. D-12)


MAP II
EXPRESS
SERVICE PACKAGES
IN BOSTON
KEY TO ROUTES:
SOUTH STATION
COPLEY
SO. STA. - COPLEY
CAMBRIDGE
LONGFELLOW
BRIDGE
BOSTON
EXPRESSWAY
ATLANTIC AVE
CHANNEL
POINT
FORT
SOUTH STATION
BOSTON COMMON
PUBLIC GARDEN
HARVARD BRIDGE
MASS. AVE
COMMONWEALTH AVE
BOYLSTON ST
KNEELAND ST.
ST JAMES ST.
STUART ST.
MASS. TURNPIKE
PRUDENTIAL CENTER

(FIG. D-13)

(FIG. D-14): COMPARISON OF EXISTING EXPRESS BUS AND COMMUTER RAIL SERVICES/ASSUMPTIONSFOR SERVICE PACKAGES

	Existing Service:				Service Packages:	
Type of Service	Express Bus (300)	Express Bus (302)	Express Bus (304)	Needham Commuter Rail	Service Package I	Service Package II
Type of Service						
Origin	Riverside	Watertown	Watertown	Four Stations		
Destination	Summer & Chauncy	Copley	Summer & Chauncy	South Sta. & Copley		
Date of Count	9/3/74	5/29/73	9/3/74	5 dats in April, 1974		
Inbound-Daily Riders	1,618	329	2,392	4,041	800	300
Inbound-3 Hour Peak Riders	1,589	302	1,489	3,895	770	300
Ratio-3 Hr: Daily	98%	92%	62%	96%	96%	100%
Inbound-Peak Hour Riders	900	170	732	3,280	580	250
Ratio-1 Hr: 3Hr.	57%	56%	49%	84%	75%	84%
Peak Hour Riders/Bus	50	28	56		44	34
Hours of Operation	9	4	11	15	16	6

(FIG. D-15): SERVICE FREQUENCIES AND CAPACITIES INBOUND FROM NEEDHAM

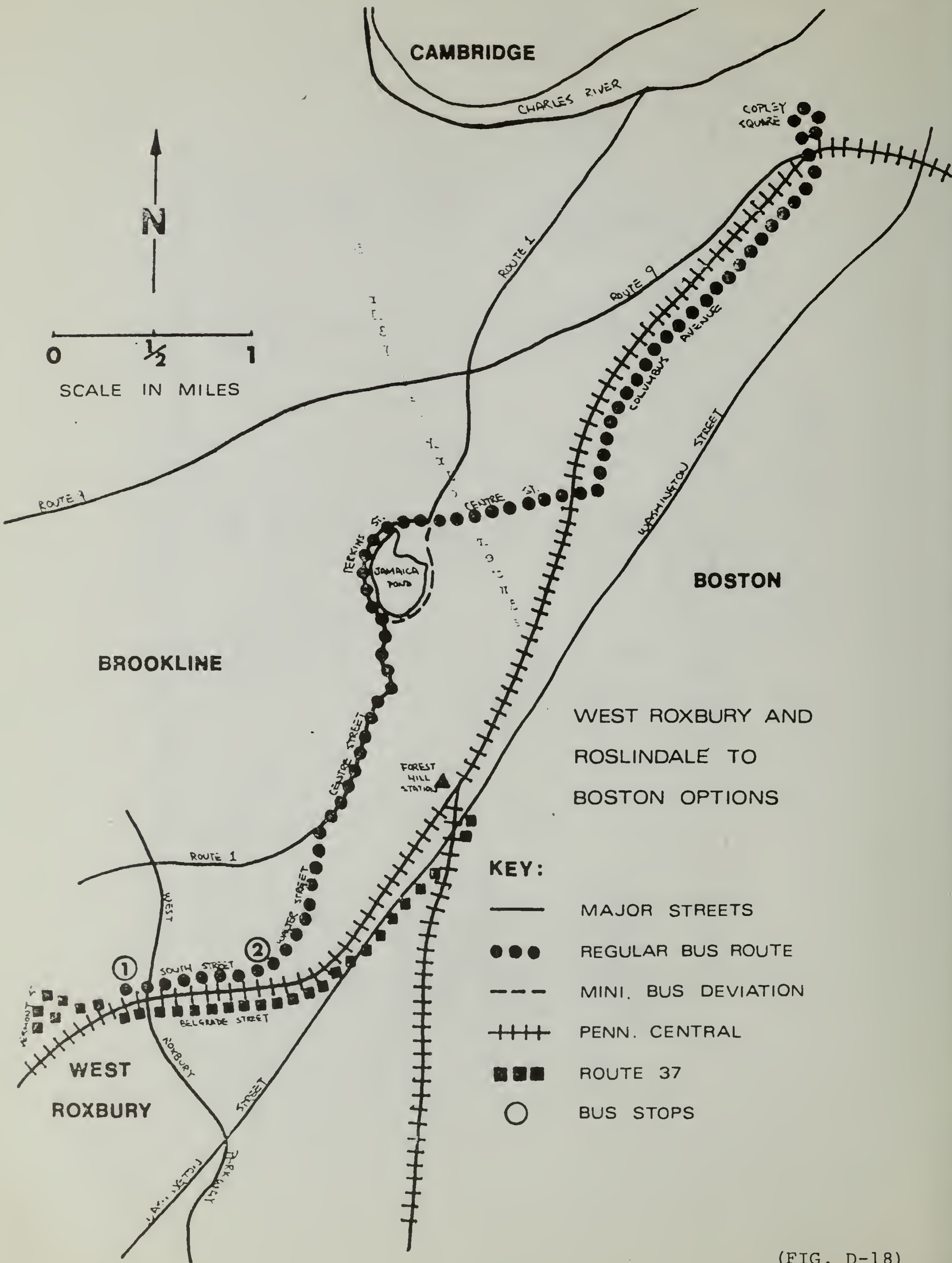
	Service Package I: Departures	Service Package I: Seated Capacity	Service Package I: Demand	Service Package II: Departures	Service Package II: Seated Capacity	Service Package II: Demand	Current Rail Service: Departures	Current Rail Service: Seated Capacity	Current Rail Service: Demand-(4 Needham Stations
Weekday									
Peak Hour (AM)									
To South Station	9	450	580	5	250	250			
To Copley	3	150		2	100				
To South Station							3	1350	660
Peak Period (AM)									
To South Station	14	700	770	9	450	300			
To Copley	3	150		2	100				
To South Station							5	1710	780
Daily									
To South Station	30	1500	800	13	650	300			
To Copley				2	100				
To South Station							12	2250	810
Weekend									
To South Station	10	500		0	0		7	630	
To Copley									
To South Station									

(FIG. D-16): TRAVEL TIMES OF SERVICE PACKAGES AND CURRENT RAIL SERVICE (IN MINUTES)

	Service PKG I	Service PKG II	Commuter Rail	Service PKG I	Commuter Rail
Time of Day:	AM Peak	AM Peak	AM Peak	Midday	Midday
To: South Station					
From-Needham Hts.	41	27	42	43	40
Needham Ctr.	37	33	39	39	36
Needham Jct.		34	36	35	31
Birds Hill	32		33		28
To: Copley					
From-Needham Hts.	41	27	38	32	36
Needham Ctr.	37	33	35	28	32
Needham Jct.		34	32		27
Birds Hill	32		29	24	24
From: South Station					
To - Needham Hts.	27	27	36	34	36
Needham Ctr.	30	31	33	38	33
Needham Jct.		33	30		30
Birds Hill	36		27	42	27
From: Copley					
To - Needham Hts.	23	23	31	20	32
Needham Ctr.	27	27	28	24	29
Needham Jct.		28	25		26
Birds Hill	32		22	28	23

(FIG. D-17): MOCK SCHEDULE

	A.M. PEAK			MIDDAY		MIDDAY	
	Bus to South Station	Bus to Copley	Commuter Rail	Bus	Rail	Bus	Rail
	(READ DOWN)			(READ DOWN)		(READ UP)	
Service Package I							
Needham Hts.	7:26	7:22	7:25	11:57	12:00	3:34	3:36
Needham Ctr.	7:30	7:26	7:28	12:01	12:04	3:38	3:33
Birds Hill	7:35	7:31	7:34	12:05	12:12	3:42	3:27
Copley		8:03	8:03	12:29	12:36	3:14	3:04
South Station	8:07		8:07	12:40	12:40	3:00	3:00
Service Package II							
Needham Hts.	7:40	7:36	7:25				
Needham Ctr.	7:34	7:30	7:28				
Needham Jct.	7:33	7:29	7:31				
Copley		8:03	8:03				
South Station	8:07		8:07				


CAMBRIDGE
CHARLES RIVER
COPLEY SQUARE
N
0
1/2
1
SCALE IN MILES
ROUTE 1
ROUTE 9
COLUMBUS AVENUE
WASHINGTON STREET
CENTRE ST.
PERKINS ST.
JAMAICA POND
BOSTON
BROOKLINE
CENTRE STREET
FOREST HILL STATION
WEST ROXBURY AND
ROSLINDALE TO
BOSTON OPTIONS
ROUTE 1
WEST
WALTER STREET
SOUTH STREET
BELGRADE STREET
ROXBURY
STREET
WEST
ROXBURY
KEY:
MAJOR STREETS
REGULAR BUS ROUTE
MINI. BUS DEVIATION
PENN. CENTRAL
ROUTE 37
BUS STOPS

(FIG. D-18)

(FIG. D-19)

TRAVEL TIMES TO BOSTON

Station Vicinity	Via Needham Branch	Via Feeder Bus and Orange Line
West Roxbury	27 minutes	34 minutes
Highland	25 minutes	32 minutes
Bellevue	22 minutes	29 minutes
Roslindale	19 minutes	24 minutes

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APPENDIX

Appendix E

RAPID-TRANSIT TRACTION POWER SUPPLY AND DISTRIBUTION

Contents

Appendix E

RAPID-TRANSIT TRACTION POWER SUPPLY AND DISTRIBUTION

I. GENERAL

For the purposes of this study, two types of traction power were studied:

Overhead Catenary System
Third Rail System

With either system, the traction power supply would have a voltage range of 450-690 volts do.

A. Overhead Catenary System

In this alternative, it is proposed that a 212 kc mil, hard-driven, grooved, bronze contact wire of 80% conductivity will be supported from a messenger wire of 500 kc mil, hard-drawn, stranded copper. The conductors will have dead ends spaced approximately one mile apart. Where two sections of catenary adjoin each other, they will be overlapped for short distances to provide air gaps. These air gaps can be switched or jumped for sectionalizing purposes.

Two (2) 1000 kc mil supplemental feeders of hard-drawn copper will be provided for each track. One feeder will tie to the catenary at each pole; the other will feed the catenary where required by final engineering for voltage support.

It is proposed to use modern, steel cantilever brackets mounted on rainforced concrete foundations. A normal contact wire height of 16'-0" above top of rail will be maintained with an allowable minimum of 15'-0" under any structures.

It is planned that the switch-over from catenary to third rail power would take place at either South Cove or Back Bay Stations.

The cost of equipping present No. 11 Orange Line cars with overhead pantograph to enable dual (third-rail/catenary) operations is estimated to be $18,500.00 per car, based on 1976 dollars and the work being done by M.B.T.A. forces.

B. Third-Rail System

At present, on the Haymarket North Project, a high-conductivity, aluminum composite, third rail has been installed. This rail is an 85 lb. section with aluminum extrusion fastened throughout the web with high-tensile bolts producing a copper equivalent capacity of 6 MCM. In this alternative, this same type of high-conductivity third rail is being proposed in order to reduce electrical energy losses. The cost of the third rail has been added to the power cost estimate developed for this study.

II. SUBSTATIONS

For either the overhead catenary or third rail alternative, preliminary engineering for substation design is being developed under another study contract. The supervisory control system is also to be provided under separate contract and no costs are herein included for substations, sectionalizing or supervisory power control.

III. COMPARISON OF THIRD RAIL VS. CATENARY ELECTRIFICATION

During the past few years, increased interest in expanding or constructing new electrified transit systems has been responsible for regenerating the two basic schools of thought for traction power systems. In the last few years, traction power techniques have received a new impetus due, on one hand, to the development of new light rail vehicles (LRV) coupled with the desire to extend transit operation from the core city into heretofore railroad suburban areas and, on the other hand, to reach a policy decision on such problem areas as highway grade crossings, attainment of adequate overhead clearances, negative environmental impacts, and construction and operating costs.

Only with a thorough understanding of all critical elements involved can a logical decision be made as to whether overhead catenary or third rail propulsion can best serve the traction power need. Although not all of the factors discussed herein necessarily pertain to this segment of the Southwest Corridor, future planned extensions of the Authority's system dictate that a long-range analysis should include comprehensive discussion of all elements.

A. Planning and Design Factors

Any traction power system installed today will, assuming a 40-to 50-year life, be in service until the period 2015 to 2025 and must be capable of meeting the traffic demands during the first quarter of the 21st century. The following practical and economical factors pose the major questions to be answered in evaluating the comparative merits of disadvantages of any overhead catenary versus third rail system.

1. Ultimate required operating headways and train lengths.

2. Number of highway grade crossings.

3. Number and clearances of existing overhead bridges, underpasses, and tunnels evaluated to determine the cost of obtaining adequate clearance for catenary operation.

4. Degree of inter-penetration with any present subway (third rail) operation.

5. Environmental impact of overhead catenary on communities involved.

6. Increased hazards of third rail operation at grade to trespassers.

7. Capital costs, operating costs, and maintenance problems of catenary versus third rail systems.

8. Capital and operating costs of any automatic highway grade crossing protection devices required with the overhead catenary alternative. (For this particular segment extension of the Orange Line no highway grade crossings exist.)

9. Cost of grade separation (with or without third rail).

10. Reliability of overhead catenary versus third rail.

B. Discussion

1. Operating Headways

Close headways and large train consists cause correspondingly heavy traction power load requirements such that supplemental power feeders are required to an overhead contact wire that would not be required with the heavier current carrying capacity of third rail.

2. Number of Highway Grade Crossings

With an absence of highway grade crossings on this particular line segment, a major comparative cost for the necessity of grade separation (for third rail operation) is automatically eliminated.

3. Overhead Bridges

To obtain sufficient overhead clearance for M.B.T.A. overhead catenary operation, all overhead bridges and underpass structures must have a minimum overhead clearance above top of rail of 15' -9". A 17'-0" clearance is more desirable in order to eliminate sudden changes in profile of the contact wire and corresponding wear from pantograph passage. Standard M.B.T.A. design criteria is based on a maximum 24 gradient of the overhead contact wire. A minimum of approximately 15' -0" must be available within the subway if a car equipped with an overhead pantograph (in the locked-down position) is to be operated from the third rail.

Clearances under bridges may be obtained by either depressing the track or raising the structure (or both)--dependent upon the engineering analysis. The following four (4) overhead bridges presently have overhead clearances above top of rail of less than 17'-0":

Location	Approximate OH Clearance
W. Newton Street	15'-11"
Dartmouth Street	16'-6"
Clarendon Street	16'-6"
Columbus Avenue	15'-10"

These structures presently meet the 15'-9" minimum overhead clearance criteria and could remain without rebuilding provided the new transit tracks are not raised above the present top of rail and that the overhead catenary profile be properly graded in approach to each of these structures. If these structures are to be rebuilt for other reasons, a 17'-0" clearance would be most desirable for pantograph operation.

4. Inter-Penetration with Subway

The present Orange Line subway and the new South Cove Tunnel contain sufficient clearance to allow operation of pantograph-equipped cars in the locked-down position.

5. Environmental Impact

Even with an underground conduit and manhole system for propulsion feeder cables coupled with the use of a low profile catenary and trolley wire structure, the overhead catenary system normally has a negative environmental impact on most communities, dependent to a great degree on land and aesthetic values of the surrounding and abutting areas.

In addition, all overhead bridges should be adequately protected in order to shield the public from coming in contact with the overhead catenary. Troughing or protective boards must extend 10' minimum each side of all overhead bridges.

6. Increased Hazards with Third Rail

Third rail operation introduces an inherent hazard which, even with complete right-of-way fencing, trespassers may well gain access to the electrified property. The use of third rail in the depressed track scheme also introduces the hazard of vandals throwing debris onto the tracks which can short-circuit the third rail system thereby disrupting transit service.

With either third rail or overhead catenary anti-missile fences should be provided on all overhead bridges.

7. Capital Costs

The following comparison of capital costs was developed during the course of this study:

Item		OH Catenary	Third Rail
Basic Propulsion System*		$ 1,552,816	$ 1,323,273
Clearances		(adequate)	--
Addition of Pantographs (18,500 x 100 cars)		1,850,000	--
	Total	$ 3,402,816	$ 1,323,273

8. Operating Costs and Reliability

Operating costs for a properly designed and installed third rail system are fairly constant when adjusted for annual escalations. Maintenance costs for overhead catenary systems can be expected to follow cost cycle peaks at periods coinciding with periods of major trolley wire renewal.

In general, trolley wire renewal for the standard M.B.T.A. 4/0 grooved, bronze trolley wire will be necessitated after about 5×10^5 pentograph passages. In areas where the trolley wire may be graded, as in the approaches to overhead structures, the overhead wire will require more frequent replacement due to the wear force of the approaching pantograph.

With the rather narrow (30") M.B.T.A. standard pantograph, the maintenance of track alignment and surface on super-elevated curves becomes more critical with catenary than third rail in order that the pantograph will not override its normal registration (7-1/2" each side of center) and tear out part of the catenary system.

Some advantages of overhead catenary are derived from construction of signals and communication systems since the catenary supporting structures can often be jointly used to carry signal and communication aerial cables. Another advantage of catenary is derived when certain icing conditions occur which would require a third rail system to be heated, otherwise it may prove unreliable as a contact source of power. Ice scrapers on the cars may also be used.

The disadvantages of overhead catenary include: (a) wire breakage due to tension during extreme cold weather; (b) pantograph interference and resulting damage both to the system and the individual car; (c) the impact view of the wire, cable, and structure assembly to neighboring areas; (d) arcing during train passage; (e) a higher annual maintenance cost for cars, the track surface, and the traction power system.

9. Pantograph

In order to modify the present No. 11 Orange Line cars to enable overhead catenary operation, each car should be equipped with a pantograph and the necessary controls for dual operation. The following

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* Costs shown do not include substation, sectionalizing or supervisory control. Cost of third rail heaters are included.

installed costs per car, based on 1976 dollars, are estimated for the work involved:

400-750 Volt Pantograph	$ 6,800
Mounting & Strengthening Roof	4,500
On-Board Control Wiring	3,500
Air Line, Valves, Controls	2,000
Contingencies	1,700
Total	$18,500

The design, prototype building, and testing of the first units is included as part of the contingency unit cost.

The maintenance costs attributed to pantograph maintenance are primarily incurred in changing the contact wear plates. Other car operating costs result from maintenance of insulations (between the pantograph contact area and car body) and in maintenance of car truck snub-blocks, or similar shock-absorbing arrangements, to reduce car sway. (Any excessive lateral excursion of the pantograph due to car sway or track conditions, or a combination of both, may result in the pantograph riding off the catenary and breaking the trolley wire and damaging the pantograph with a resulting long delay in operation until the catenary can be repaired.)

One advantage of overhead catenary operation inherently occurs due to the fact that third rail operation requires heating and contact rail to prevent icing, whereas no heating of the contact wire is required with catenary operation.

The annual operating cost, including demand changes, for the power required for third rail heating (although variable depending upon winter icing conditions) can be sizable and in all probability will increase in coming years as a result of the energy situation and general increase in the cost of purchasing electrical power.

IV. RAPID TRANSIT SIGNALING AND COMMUNICATIONS

A. General

For the purposes of this study, three types of signaling for the new rapid transit extension were studied:

1. Automatic Train Control (ATC), utilizing double-rail audio-frequency track circuits with speed commands for car-borne overspeed regulation, without wayside signals except those required at interlockings.

2. Automatic Train Stop (ATS), utilizing double-rail audio-frequency track circuits, automatic wayside signals, trip stops, and interlocking signals. With this alternative, insulated joints would be provided only at wayside signal locations and provisions would be included in the design for conversion to ATC control without a major rebuilding of the system.

3. Conventional Automatic Block Signaling (ABS) with Automatic Train Stop (ATS) features employing AC, 60 Hz, double-rail track circuits, with conventional impedance bonds and fixed wayside signals.

The final recommendation and choice of final design for the system best suited to the operational needs is directly dependent upon the Authority's final decision as to whether or not the new No. 12 cars are to be equipped with car-borne ATC equipment to respond to the audio frequencies presently being installed on the Haymarket North Extension.

If the ATC-overspeed portion of the Haymarket North project is proven and accepted, then Alternative No. 1 should be the system chosen for final design and installation.

If the Authority has not fully resolved and implemented the Haymarket North ATC system by the time final system design commences for a new Southwest Extension, then Alternative No. 2 should be the primary type system to be designed and installed. This arrangement would provide for implementation of a future ATC system with a minimum of rebuilding effort.

If, however, the Authority's final resolution is to not equip the new No. 12 cars with car-borne ATC equipment, then Alternative No. 3 would provide the most reliable and economical design choice.

Comparative costs and discussion of signal system types is further detailed within this report and can form the basis for the Authority's final decision of signal design criteria contingent upon the final system installed and accepted on the Haymarket North portion and/or the new No. 12 cars.

B. Present Orange Line Signaling

Signaling of the Orange Line between Forest Hills and Haymarket Station consists of conventional automatic wayside signals controlled through 25 Hz, single-rail, AC track circuits, without cab signals or overspeed control. Automatic electro-pneumatic train stops (ATS) are employed to enforce a train to stop at a red signal.

On the new northern extension of the Orange Line from Haymarket Station to Oak Grove (Malden), a new signal system is presently being installed. This system is designed to consist of modern double-rail, audio frequency track circuits and cab signal (ATC) overspeed control signaling without wayside signals, except for the necessary interlocking signals. As part of the Haymarket North project, a new central command console is being installed as the Authority's Dewey Square Command Center to control and monitor the entire Orange Line rapid transit system. The control console also provides for the addition of new panels for future extensions of the Orange Line.

Although revenue service is presently being operated on the new Haymarket North Extension, on a reduced headway basis, the automatic train control portion (overspeed regulation) has yet to be proven and accepted. At this writing, no Orange Line cars are equipped for ATC operation.

C. Present Orange Line Communications

At present, between State Street and the new South Cove Tunnel, insufficient M.B.T.A. owned signal or communication cable facilities exist to accommodate the additional circuits that will be required for operation of the new transit extension between South Cove and Forest Hills.

V. PROPOSED RAPID TRANSIT SIGNAL SYSTEM

A. General

It is proposed that the new rapid transit line be equipped with a signal system compatible with the existing Orange Line system.

The ultimate system design will provide for full rapid transit operation from Forest Hills to Essex Street with 90-second headways and 65 mile-per-hour speeds. Emergency crossover facilities would be provided in the vicinity of Back Bay and Heath Street. The total system would be under the control of the Supervisory Console at Dewey Square.

If Orange Line cars are not ATC equipped at the time final signal system design is required, the proposed initial system would provide an automatic signal system similar in operation to the present Orange Line. It is recommended that if Alternative No. 2 is chosen, the primary system be designed for a 2-minute free-running headway which will easily accommodate the present 3-1/2 minute Orange Line operating headway. With this system, an electro-mechanical train stop will force compliance with a red signal aspect. Should a motorman pass a red signal, a brake-line trip cock on the train is activated by the wayside trip arm, thereby effecting an emergency stop of the train. After having been stopped by the automatic train stop, the guard must get off the train and activate a "key release" to allow the train to proceed without the train being repeatedly tripped as each car proceeds over the train stop.

In such an automatic train stop (ATS) system, two signals behind each train display red aspects, while the third and fourth signals display yellow and green respectively. The additional red block is introduced as a safety block in order that a train will come to a safe stop in the event it passes a red signal at maximum speed.

When it is desired to operate extremely close headways with an ATS system, it is common practice to install a series of signals spaced less than braking distance apart and locating them in the approach zone to stations. These station approach signals are controlled by time relays so that trains approaching a stopped train at a station will not be stopped if moving at pre-determined slow speeds and can close in on the first train. Such a time-signal control system approaches operation of an automatic train control system, but without full line flexibility.

The design of a signal system for Alternate No. 3 would be similar in operation to that described for Alternative No. 2 except the design headway would be for ninety seconds.

It is proposed to install an automatic preferred pocket turnback interlocking with lay-up facilities at Forest Hills. This arrangement would provide the flexibility required for rapid transit operation. This proposed interlocking will be operated automatically by trains entering or leaving the interlocking area, with preference given to the best available route. Provisions have also been made to override this automatic feature by the dispatcher if field conditions warrant supervisory control.

Either design alternative 2 or 3 would provide automatic wayside signals with automatic train stop features from Forest Hills to Essex Street for interfacing with the existing signal system. Alternative No. 2 has been developed to enable a future conversion to an automatic train control, or speed regulation, system without a major rebuilding effort.

The preliminary study analysis demonstrated that any of the three alternatives, the interfacing, tie in circuitry, and signal respacing north of Essex Street will be so extensive as to require a virtual rebuilding of the remaining portion of this old signal system to State Street.

In conjunction with the third rail track-work installation, a signal and communication duct bank is proposed to be installed along the right-of-way. This duct bank, with an average manhold pull-box spacing of approximately five hundred feet, would provide the means for interconnecting the

wayside signals and trips with a minimum amount of disturbance to the right-of-way. It would also provide the necessary access to the right-of-way for conversion of the signal system, if and when the Authority operates cars equipped with the necessary on-board speed regulation equipment.

With the overhead catenary traction power alternative, aerial signal and communication cables could be installed on the cayenary structures, in lieu of underground duct. This construction, while effecting some cost saving, could create a negative environmental impact. Construction cost estimates have been developed for both underground and aerial signal cable for the overhead catenary alternatives.

B. Track Circuits

All track circuits in the automatic wayside signal territory will be either audio-frequency or 60 Hz AC double-rail track circuits except those on the crossover portion of the single or double crossovers. The crossover tracks will be equipped with 60 Hz single-rail track circuits.

The final choice of wayside type track circuits for this project will be dictated by the Authority's final decision on car-borne ATC for the new No. 12 cars or existing No. 11 cars.

C. Interlockings

The interlocking at Forest Hills will consist of power operated switch and lock movements equipped with dual-control features for use in emergency situations. Movements over these switches will controlled by color light signals. Provisions for future extension on the Needham Branch and south on the Shore Line will be included in the design.

All interlocking bungalows, or central instrument rooms outside of the tunnel areas, will be equipped with air conditioning while those within tunnel areas will be provided with positive pressure ventilation. Automatic fire extinguishing systems will be provided for all such equipment rooms.

The emergency turnback interlockings will also be provided with dual-control switch and lock movements with associated semi-automatic color light signals to control movements through these interlockings. The control of the emergency turnback facilities will be from Dewey Control Center.

D. Wayside Signals

Color light signals will be employed for all interlocking signals and automatic signals (if used). The control relays for any such wayside automatic signals will be mounted in instrument housings located at or near the signal they control.

E. Supervisory Control

The supervisory control system will be a modern, solid state code system compatible with the existing Orange Line supervisory control console.

F. Cable Facilities

Supervisory control cables will be required between Dewey Square and all central instrument rooms with provisions for future expansion south of Forest Hills. For alternatives nos. 2 and 3, signal control cables have been included for estimating purposes.

G. Power Supply

Signal power required for any wayside signal equipment located along the right-of-way will be fed from a 480-volt, 60 Hz distribution cable. The power will be transformed to 120 volts at each signal location to feed signal equipment automatic trips, third rail heaters, and related apparatus.

H. Snowmelters

Snowmelters for power switches, automatic train stops and the third rail are proposed to be controlled from the Dewey Square Control Console. These snowmelters will be all electric with provisions for indication.

I. Automatic Vehicle Identification

Automatic vehicle identification has been included as part of the turn-back facility at Forest Hills.

VI. PROPOSED RAPID TRANSIT COMMUNICATIONS SYSTEMS

The following types of communication systems are proposed for this extension of the Orange Line.

A. Radio

It is proposed that one new base station be provided to assure complete coverage of the new transit line. The exact location of this new base station should be determined by propagation tests made by a qualified communications installer.

The base station will normally be operated from Dewey Square by either leased New England Telephone Co. lines or in the communications' calbe, depending upon the final location.

B. Cable Facilities

It is proposed that a communications cable be installed the entire length of the new transit line from Forest Hills to Dewey Square. This cable facility would provide the means for intercommunications between stations, telemetering of various devices, paging systems, etc.

C. Telephone System

Three types of telephone systems are proposed to be provided to assure adequate communications for transportation and maintenance personnel. These systems are:

1. Maintenance Test Telephone - A system between Dewey Square and cerain critical locations such as power substations, switching points, signal interlockings, and equipment rooms.

2. Emergency Telephone System - A system between Dewey Square, Forest Hills, and certain stations, signal interlockings, power sub-stations, and similar critical points.

3. Centrex System - An extension of the present Centrex System for general communication to specified points and to serve as a backup to M.B.T.A. owned lines.

D. Public Address System

It is proposed that a public address system be installed in each station to be accessed by the Authority's personnel in each station or by Dewey Square.

E. Fire and Vandal Alarms

Fire and Vandal Alarm circuits are to be included as part of the supervisory code control and indication systems.

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APPENDIX

Appendix F

ENGINEERING DETAILS FOR DROPPED ALTERNATIVES

Contents

Appendix F

ENGINEERING DETAILS FOR DROPPED ALTERNATIVES

WASHINGTON/SHAWMUT TUNNEL

Detailed Route Description For Refined Alternative (Fig. F-1 to F-6)

The new tunnels for the Orange Line would connect to the existing South Cove Tunnel which has been completed to a point directly under Tremont and Marginal Streets. This existing twin track box section is poorly oriented for the purpose of relocating the Orange Line along Shawmut Avenue, since it is angled some 40 degrees westward with respect to the street centerline. In order to redirect the alignment towards Shawmut Avenue, a reverse "S" curve is required. In the process of aligning with Shawmut Avenue, the tunnel must pass under the garage and garden apartments between Herald Street and Paul Place. Construction would start at the intersection of Tremont and Marginal Streets by open-cut methods. Tunneling procedures under the Massachusetts Turnpike and the Penn Central and Boston and Albany railroad tracks require that the Orange Line track centerline distance be spread from the 20 foot dimension at the end of the existing South Cove Tunnel construction to approximately 30 feet in an effort to allow shield driving operations. This can be accomplished by a double-box transition structure that would end at the southern sidewalk of Marginal Street. From that point, two single-track, shield-driven tunnels would be constructed, passing under the Massachusetts Turnpike and the railroad tracks in the reverse curve alignment and returning to the center of Shawmut Avenue between Paul Place and East Berkeley Street. The construction would be segmented fabricated steel liners with a cast-in-place concrete invert. The track tunnels would be approximately 20'-2" (outside diameter). Consideration was given to placing both tracks in a single tunnel as shown on Fig. F-7 Detail M), but this scheme is not feasible since the track centerline distance is variable in this section of the line, and considerably greater than the 13-foot distance required for an economical twin-track, shield-driven tunnel.

The use of twin tubes in this segment of the project would compliment their use in other portions of the line allowing greater contract flexibility. The settlement zone of influence for the wider part of Shawmut Avenue indicates that little or no underpinning will be required in this section except where the trackage passes under the garage and garden apartments. Definitive soil borings are not available along this stretch, but it is believed the tunnels will be situated in soft silty clay, thirty feet below the water table. The use of compressed air during construction is considered likely.

The proposed Berkeley Street Station could be located north of Berkeley Street in the wider part of Shawmut Avenue. The station would be of the center platform type since the approaching tunnels are already spread 30 feet apart on centers. The station would be built by the cut-and-cover method requiring some utility relocations and support in the area. It is contemplated that all stations will have 420-foot platforms.

South of East Berkeley Street, the alignment splits (outbound and inbound). The outbound track is located at the centerline of the street. Only a single-track tunnel has been proposed due to the close proximity of buildings.

Tunneling operations would proceed under the street without significant disturbance to residents, and traffic. Muck would be removed from shafts located at cross-street locations along Shawmut Avenue. Utility relocations would only involve those older lines which cannot stand the gradual subsidence of 2 to 3 inches that is to be expected with this type of construction. The use of compressed air will be required since the ground formations tunneled

through are generally soft clays north of Madison Street and sands to the south. The tunnel centerline in this segment would be approximately 20 feet below the prevailing water table.

A stations is proposed at Massachusetts Avenue. This station has a side platform on the east side of the track (Fig. F-7 - Detail N) which would connect to the inbound platform situated along Washington Street. Passenger access would be from Massachusetts Avenue. At the southerly end of Shawmut Avenue, the outbound track would enter a new Dudley Square Station. Because of the narrow width of Shawmut Avenue, the station would be an over-and-under facility (Fig. F-7 , O&P). Another functional reason for the over-and-under design is that the trackage south of Dudley Square, under Washington Street, will also have to be of the over-and-under twin-box type.

The inbound track from East Berkeley Street to Roxbury Street has been located for the main part on Washington Street in the west side aisle formed by the curb and the westerly line of elevated structure columns. The inbound track south of the East Berkeley Street Station curves eastward toward Washington Street going cross-lots for a distance of about 600 feet and dropping so that the top of the tunnel structure will be about 25 feet below ground level. This alignment will serve to minimize settlements of buildings in the area and lessen operating noise and vibrations. The area is presently used as a playground on the Shawmut Avenue side, with commercial properties fronting on the Washington Street side. The initial part of the inbound trackage would be built as a single-track, shield-driven tunnel using the same segmented fabricated steel lining discussed for the previous section. At the point where the alignment runs on Washington Street, the method of construction changes to a reinforced concrete single box cut-and-cover tunnel (Fig. F-8 - Detail Q). This single box construction continues southward, being interrupted by the Massachusetts Avenue Station. Washington Avenue is relatively narrow north of Massachusetts Avenue, but widens out south of that street. The cut-and-cover construction was chosen so as to better control settlements of the elevated line which could not be done by the shield-driven, tunnel method. It is felt that any uncontrolled settlement of the elevated structure could seriously affect its integrity and operational usefulness during the construction period. The option to use tunneling techniques, therefore, as an alternative construction method cannot be judged without extensive soils and foundations investigations.

At Ball Street, Washington Street narrows down and the elevated structure columns are no longer located in the middle of the street. The columns are located outside of the curb lines, approximately 43 feet face-to-face. This portion of Washington Street rapidly changes south of Ball Street to a very busy commercial area terminating at Dudley Square. It is felt that cut-and-cover construction here would be a severe economic handicap to the business community. Accordingly it was decided that a tunneled section would best serve environmental and community needs. Since construction of a station by cut-and-cover methods in the Dudley Square area would also not be acceptable, the inbound route alignments are shifted to Shawmut Avenue. Using 1,000-foot radius curves between stations and a 500-foot radius at the new Dudley Square station, plus suitable spiral lengths in between, the alignment can be routed from Washington and Ball Streets cross-lots to the northern end of the new Dudley Square Station on Shawmut Avenue. The inbound track level would be lowered so that it comes in below the outbound track at the relocated Dudley Square station. A minimum of 28 feet are required between top of rail of inbound and outbound tracks to permit shield tunneling. The additional depth of the inbound track at this location is also useful in reducing settlements and operating noise and vibrations in the cross-lots region. It is anticipated that most properties will not have to be underpinned, only those immediately (within 35 feet) of the track centerline.

The Dudley Square Station has been previously described. The inbound platform has been located 28 feet below the outbound platform to match the minimum distance that shield-driven tunnels can be constructed in an over-and-under arrangement.

The route south of Dudley Square has been laid out as twin over-and-under tunnels that are aligned cross-lots from Roxbury Street and Shawmut Avenue to Bartlett and Washington Streets. In all probability the lower or inbound tunnel will be in rock (Fig. F-8, Detail R). The upper or outbound tunnel will probably be founded on rock with its top in sands or gravels. A horseshoe section (Fig. F-8, Detail S) has been utilized to carry out tunneling operations. Both tunnels end at Bartlett and Washington Streets where the construction changes to cut-and-cover twin boxes arranged over-and-under because of the narrow width of Washington Street and the narrow space between elevated structure columns (35 face-to-face) (Fig. F-8, Detail T). Tunneling operations would likely be conducted under free air. The subgrade would be dewatered down to the rock level. The over-and-under twin box arrangement has been selected to carry the track alignment south of Bartlett Street. If sufficient rock cover can be verified in this section, it would be possible to place two rock tunnels side by side as shown on Fig. F-8, Detail T, as an alternative.

The section of Washington Street south of Elmore Street widens to approximately 40 feet between curbs and 42 feet between face of elevated structure columns. This wider condition will allow twin box side-by-side construction in a cut-and-cover trench. Accordingly, the lower or inbound track has been brought to the same grade as the outbound track. The two tracks run side by side at the same track level from Corliss Street south. Stations have been located north of Columbus Street and at Glen Road (Green Street). The stations would be of the side-platform type. Little information is available concerning geology and Orange Line structures foundation south of Valentine Street. The conglomerate formations tend to dip down south of Green Street and are overlain with gravels and sands. The water table in the southern section is expected to be approximately 25 feet above track level. The subgrade will have to be dewatered in this area to allow construction in the open to proceed.

At the end of Washington Street the relocated subway is located westward of the existing Orange Line in order to avoid the massive reinforced concrete piers which support the structure. The relocated Forest Hills Station has also been laid out as a side platform facility. South of the new station a switch-back track tunnel has been provided to allow for train turnaround. The switch-back track has been extended to come up to the existing MBTA storage tracks and shop area which are at or above grade. Provisions to extend the Orange Line trackage southward can be made by connecting the trackage south of the Forest Hills station to additional tracks to be placed on the Penn Central embankment.

Construction Estimates

The cost estimates presented here are preliminary but are believed adequate for estimating the magnitude of the cost of Orange Line subway studied. The costs reflect completion of the project with track signals, ventilation provisions and stations completed. The basic estimate represents a contractor's bid, including his profit; to this 25% has been added for top accounts to allow for contingencies and engineering.

Cost of maintaining traffic and repaving backfilled open-cut areas are included in the estimate. Underpinning of building and the elevated steel track structure and station is included as well as the removal of the elevated steel structures and general restoration of the street areas after removal of the 'El'.

Costs of permanent and temporary rights-of-way are not included. Also to determine a true cost level, the interest during construction must be also added. Top accounts for administration of contracts and legal or other fees connected with the acquisition of rights-of-way or other costs which have not been evaluated.

The actual costs were prepared by analyzing the construction costs and selecting applicable unit prices for each of the track tunnel section types which have been developed as being reasonable choices to permit construction to proceed along the alignment with a minimum of disruption to both existing structures and existing traffic patterns. The costs per linear foot of each section type was derived and these costs applied to the actual length of running track wherever that section was used. For cut-and-cover sections the greater structural requirements for increased depths of cover over the top of the track tunnel was evaluated. For shield driven tunnels in high water table areas the costs of tunneling operations using compressed air was included by applying a labor factor reflecting incroased labor costs for compressed air shield excavation.

The six stations along the line were estimated by developing preliminary station cross sections, estimating quantities, and applying unit prices similar to those used for the track tunnel stations to the station quantities.

The results of the cost estimation are shown in summary as Fig. F-9. Cut-and-cover operations were conservatively chosen as necessary in order to maintain the structural integrity of the elevated Orange Line. This decision would tend to understate the construction costs.

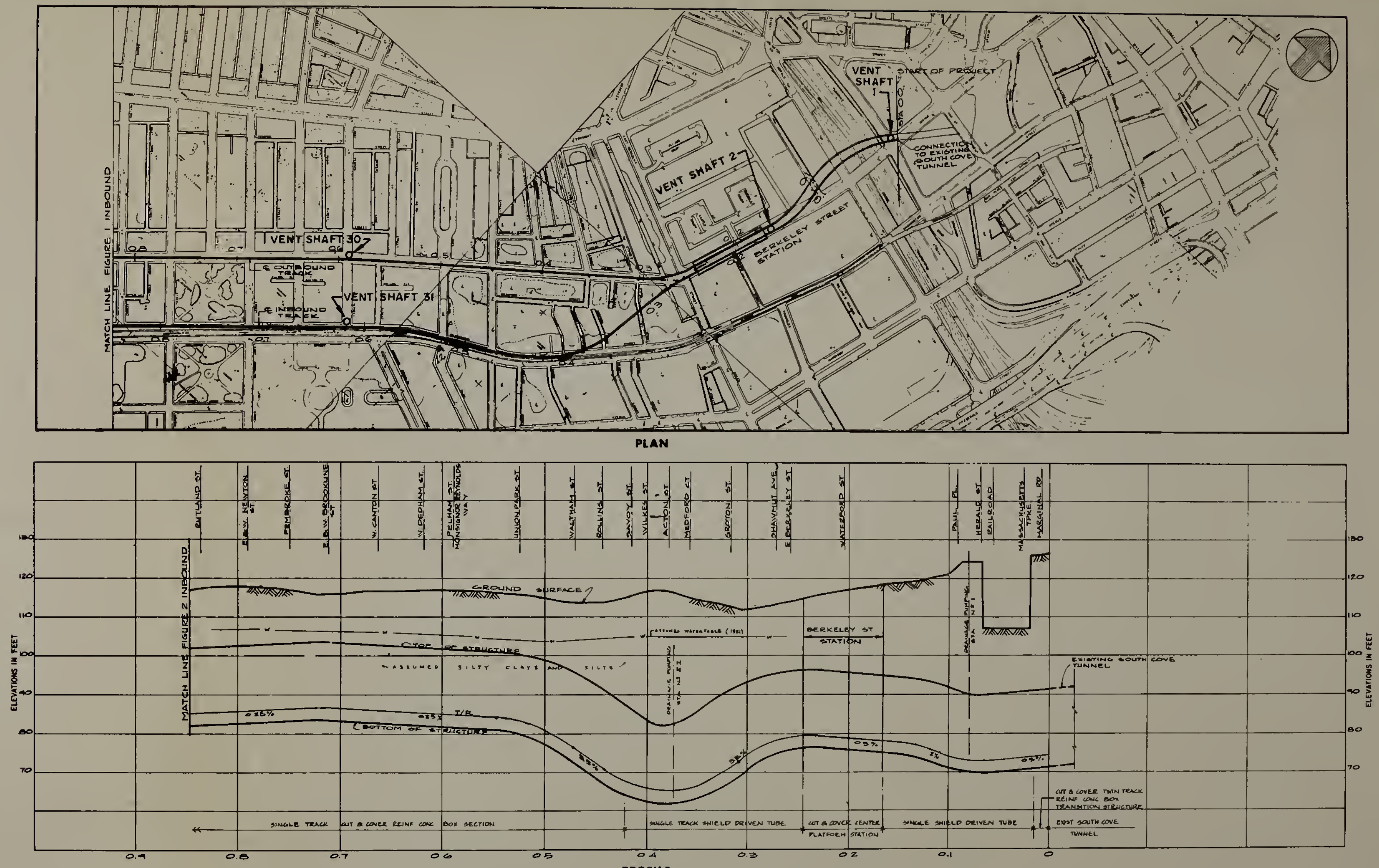
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

WASHINGTON / SHAWMUT TUNNEL ALIGNMENT



PLAN

PROFILE

SCALE

0 100 200 300

FIGURE

F-1

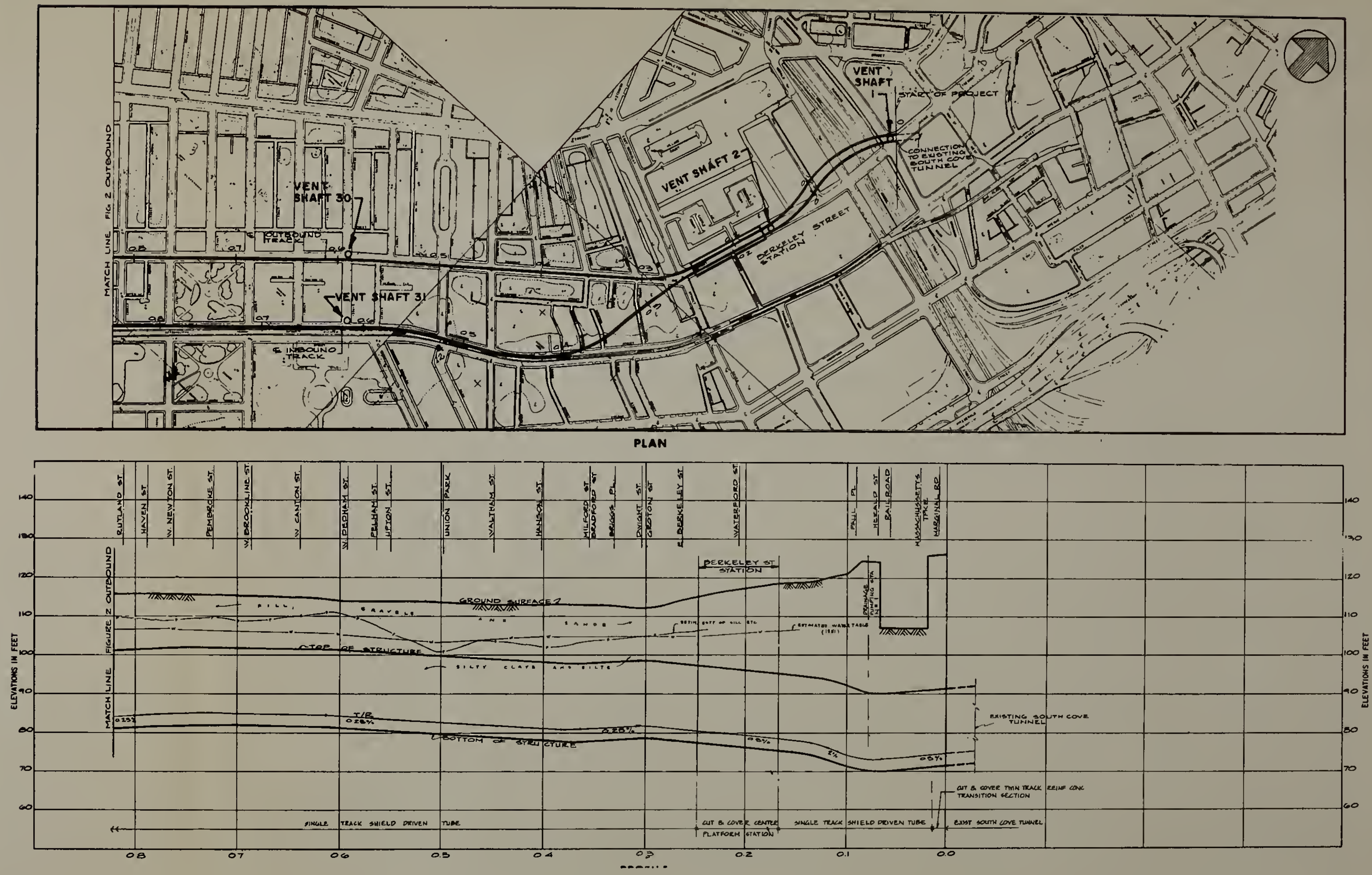
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

WASHINGTON / SHAWMUT TUNNEL ALIGNMENT



SCALE

0 100 200 300

FIGURE

F-2

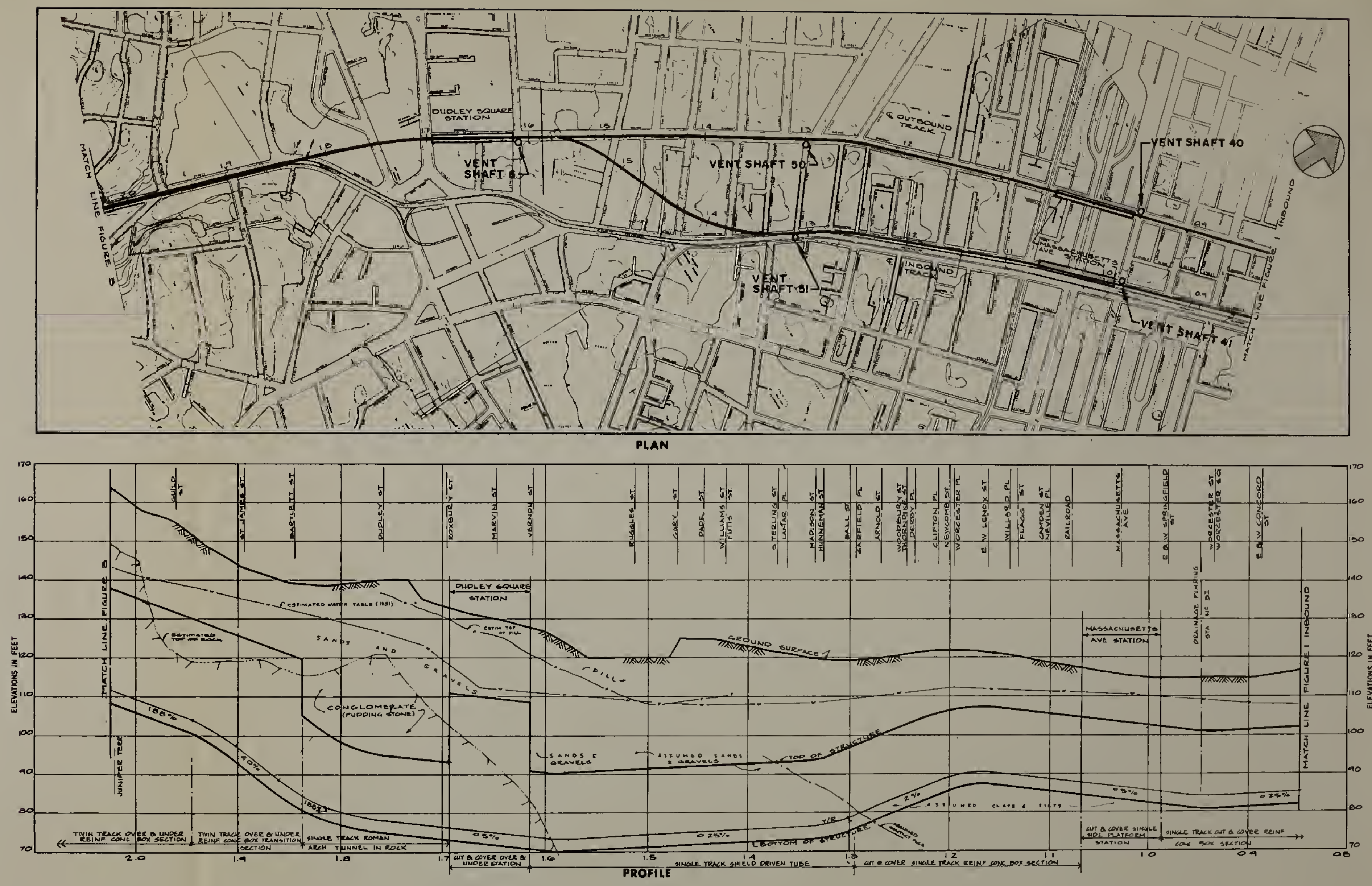
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

WASHINGTON / SHAWMUT TUNNEL ALIGNMENT



SCALE

0 100 200 300

FIGURE

F-3

FIGURE F-4

SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

WASHINGTON / SHAWMUT TUNNEL ALIGNMENT

SCALE

0 100 200 300

FIGURE

F-4

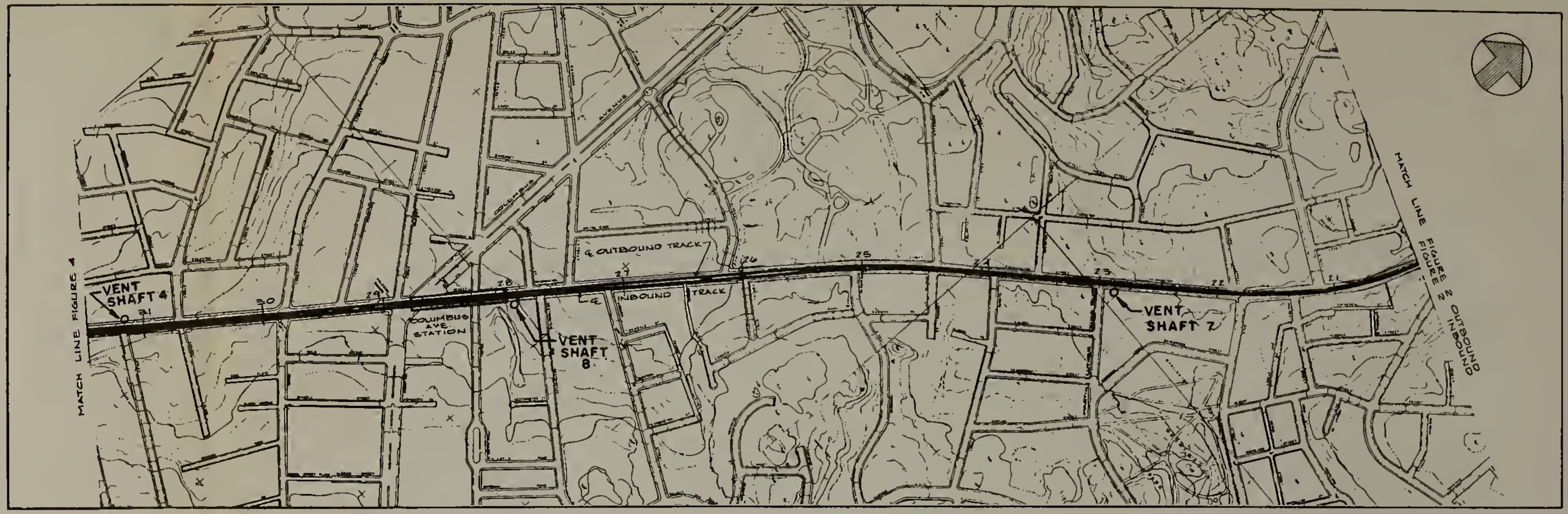
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

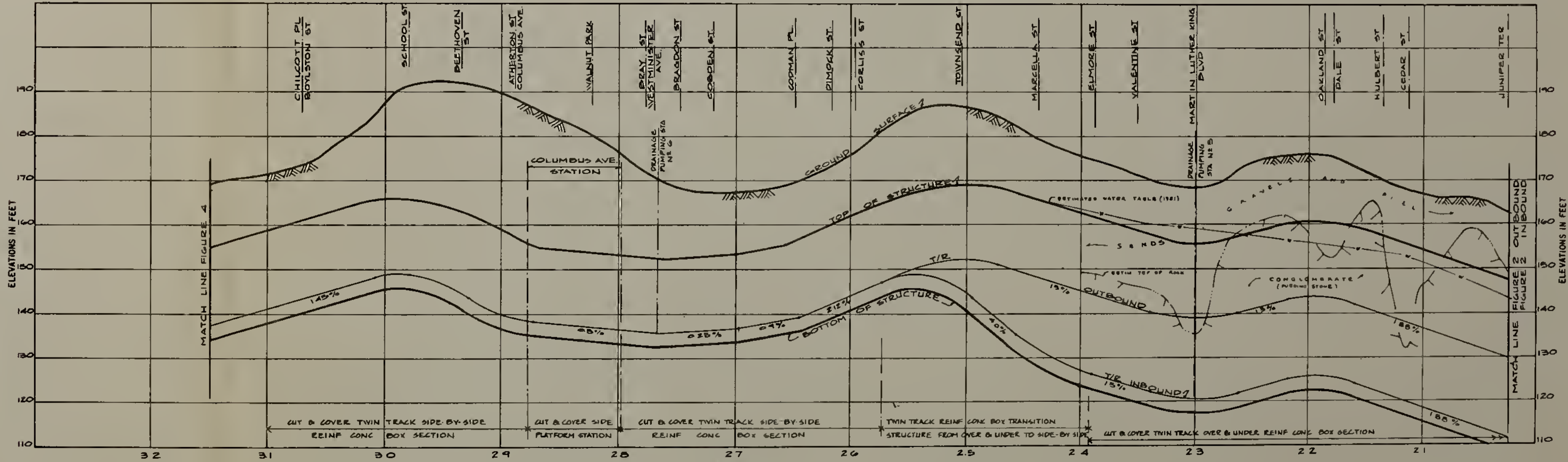
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

WASHINGTON / SHAWMUT TUNNEL ALIGNMENT



PLAN



PROFILE

SCALE

0 100 200 300

FIGURE

F-5

FIGURE F-6

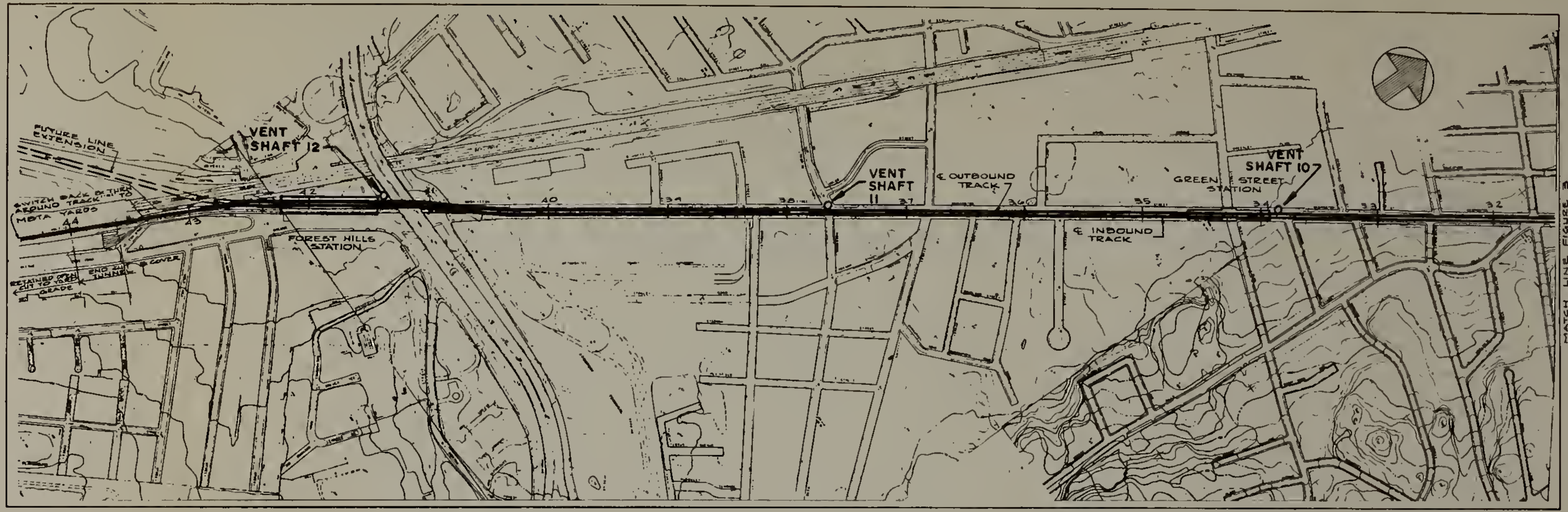
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

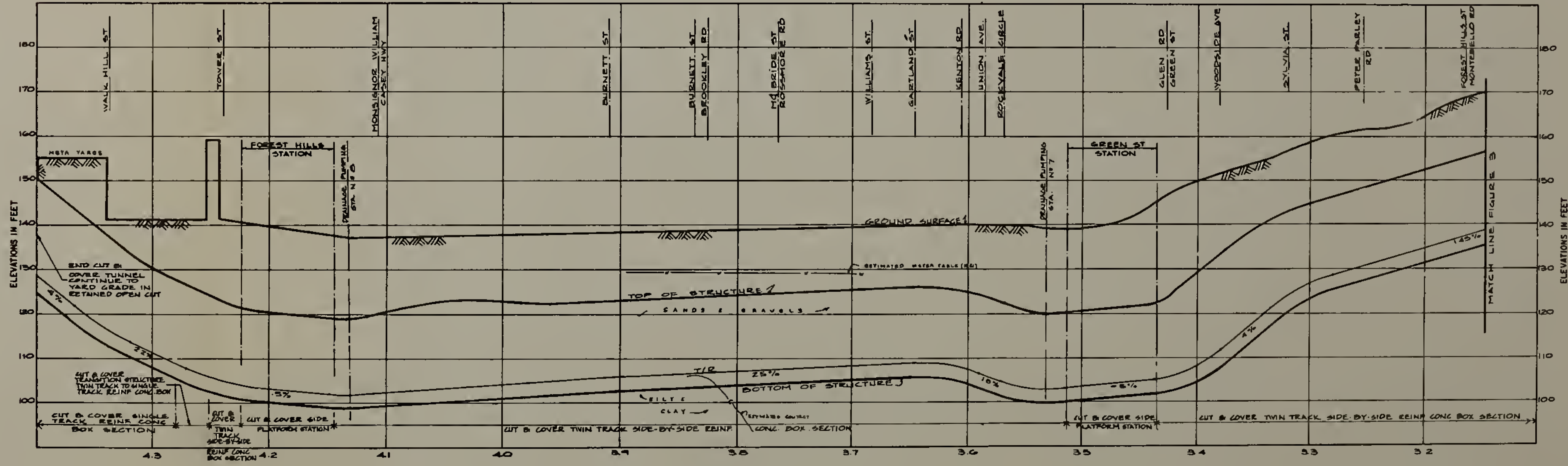
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

PLAN & PROFILE

WASHINGTON / SHAWMUT TUNNEL ALIGNMENT



PLAN



PROFILE

SCALE

0 100 200 300

FIGURE

F-6

FREDERIC R HARRIS INC

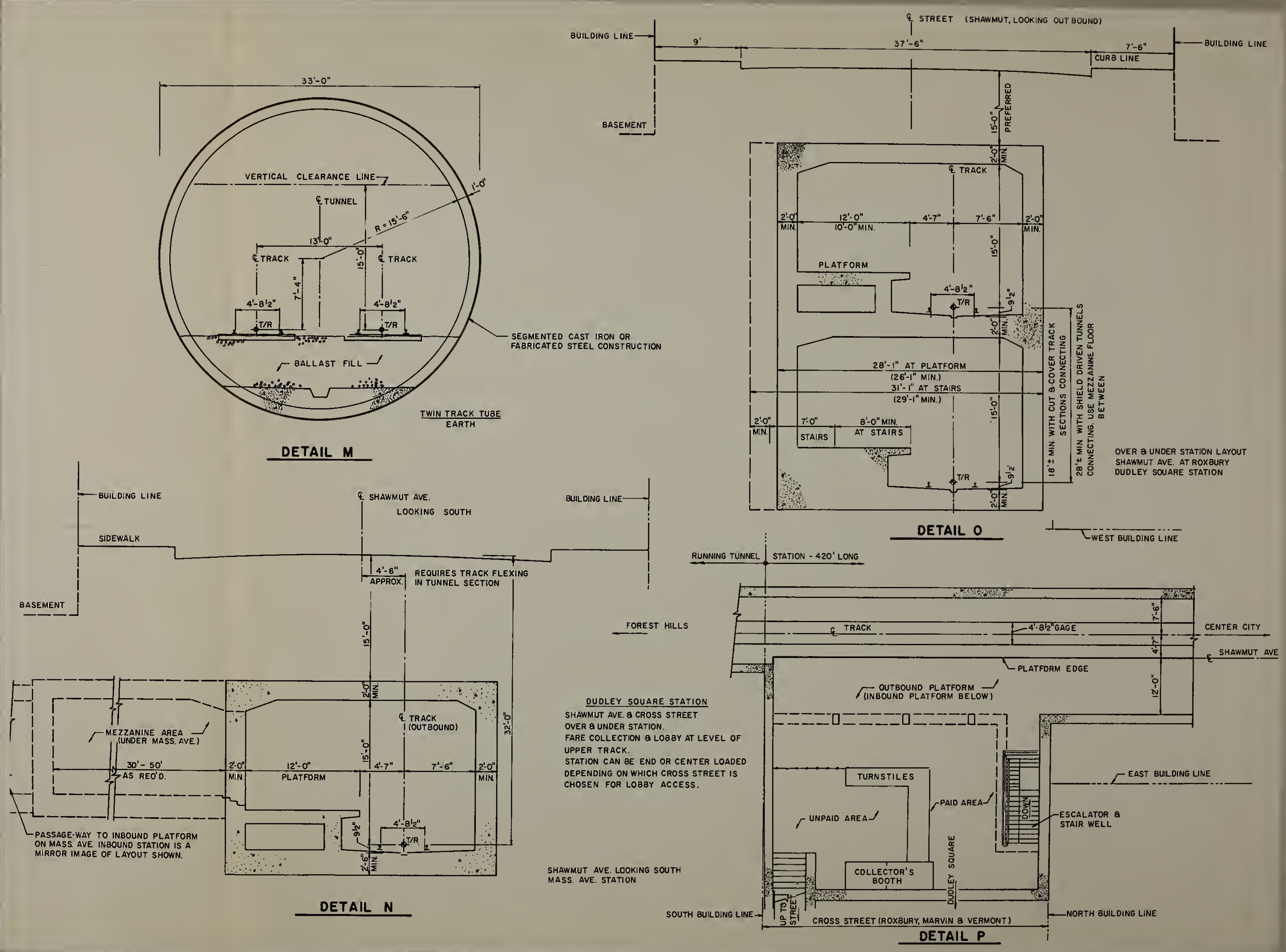
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DETAILS

WASHINGTON / SHAWMUT TUNNEL



NO SCALE

FIGURE F-7

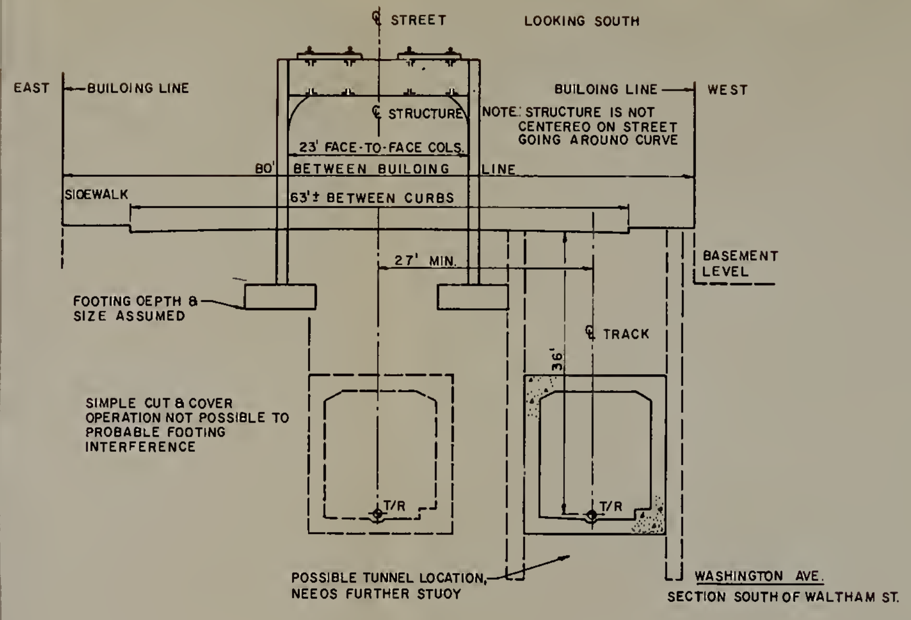
SOUTHWEST CORRIDOR TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL IMPACT ANALYSIS

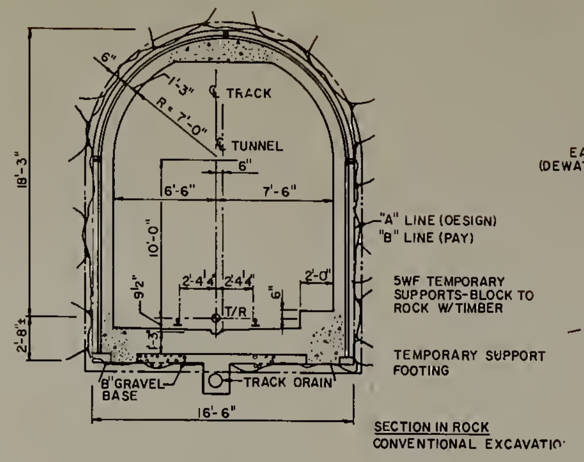
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DETAILS

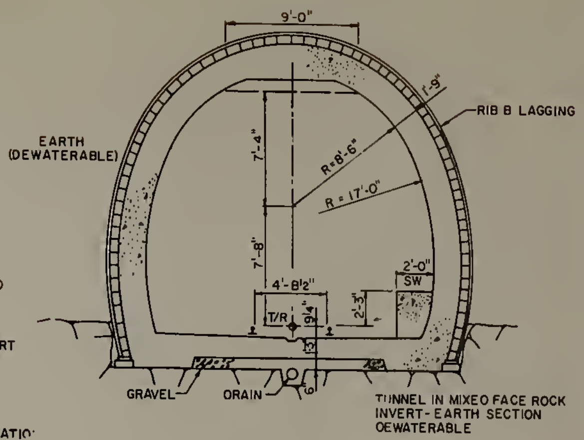
WASHINGTON / SHAWMUT TUNNEL



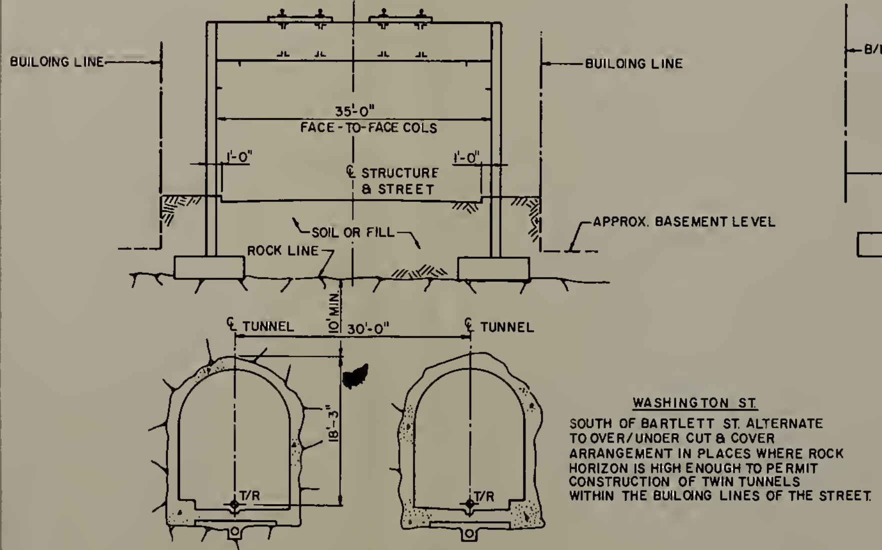
DETAIL Q



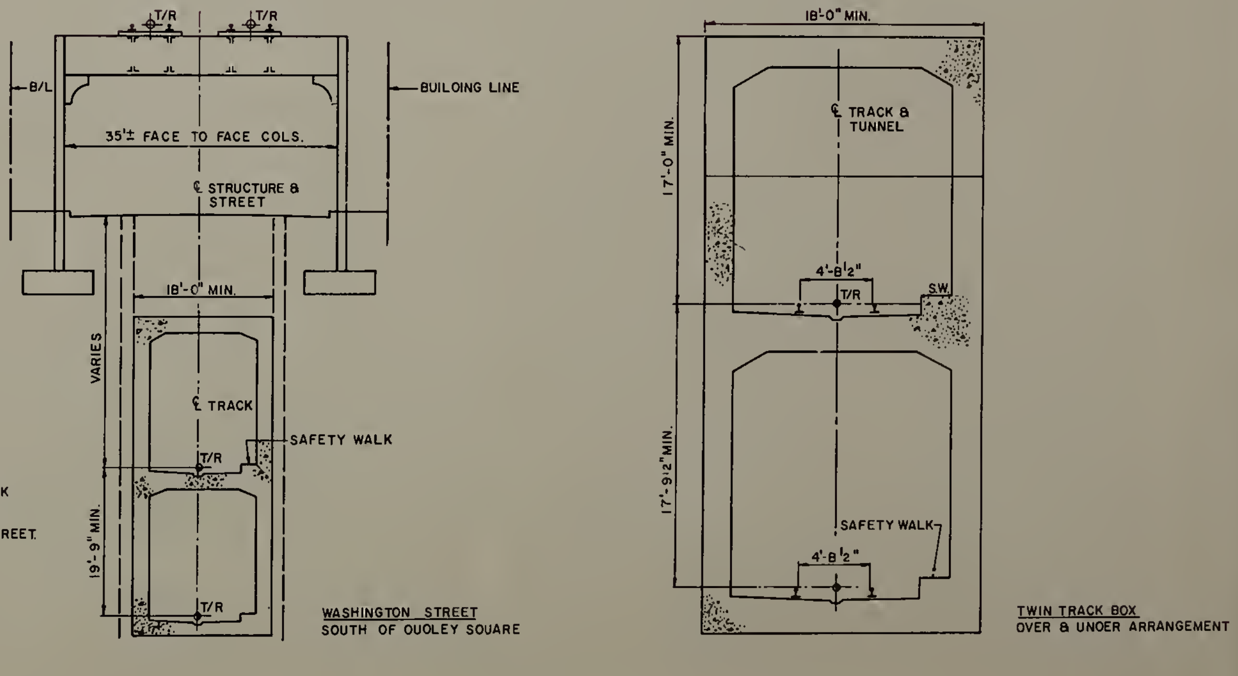
DETAIL R



DETAIL S



DETAIL U



DETAIL T

NO SCALE

FIGURE F-8

(FIG. F-9)

ESTIMATED CONSTRUCTION COST

WASHINGTON/SHAWMUT SUBWAY

Item	Estimated Construction Cost in Thousands
Running track and stations structural and civil work	231,800
Drainage pumping stations	450
Fan and vent shafts incl. fans	6,000
Utility relocations and support (publicly owned)	10,000
Mobilization and demolization	6,000
Maintain and protect traffic	600
Underpin elevated line	7,200
Underpin buildings	6,600
Track drainage	1,850
Embedded electric conduit	6,900
Station architectural	4,000
Transit trackwork	3,900
Transit power and signaling	9,200
Lighting	370
Demolish elevated structure	1,420
Total	296,290,000
Rounded	296,000,000
Contingency 25%	74,000,000
TOTAL	$370,000,000

g

APPENDIX

Appendix G

RELEVANT CORRESPONDENCE

Contents

43301
43302

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE DEPARTMENT
SOUTHWEST CORRIDOR DEVELOPMENT COORDINATOR
8 ASTICOU ROAD, BOSTON, MASS. 02130 - (617) 522-6071

Michael S. Dukakis
GOVERNOR

May 1, 1976

Col. Warren Higgins
Director of Construction
MBTA
500 Arborway
Boston, MA 02130

Dear Colonel Higgins:

As you know, the Southwest Corridor Working Committee, and its Neighborhood Sub-Committes and Task Forces have met regularly during the last 3 years in order to advise the MBTA and Mass DPW in matters concerning their actions in the Southwest Corridor. The purpose of my writing is to briefly summarize the organization of these groups in the public participation process and to itemize their meetings.

The Working Committee was created by Memorandum of Agreement (attached) among several public agencies of the City of Boston and the Commonwealth. This agreement was signed by the Governor and Mayor and witnessed by many community organizations.

The agencies agreed to meet in an open public forum in discussing all matters pertaining to planning in the Corridor. The full committee, which is also composed of the citizen representatives of several community organizations and which is constituted as a sub-committee of the Region's Joint Regional Transportation Committee is open to new organizations which choose to join. It provides the place of discussion for Corridor-wide issues such as the drafting of the scope of EIA consultant work and the narrowing of alternatives in the EIA process.

Sub-committies, called Neighborhood Committees, meet to discuss local issues and have advised in the drafting of all land use plans and in the discussion of design issues concerning station location and arterial configuration.

In addition, Task Forces are established to discuss detailed technical matters, such as noise control measures in the South End/St. Botolph area, disposition procedures for excess structures in the Corridor, and Commuter Rail service and long term railroad flexibility.

Attached please find a complete list of all Southwest Corridor Committees and of their major meetings.

It is intended that these committees will continue to function as the project proceeds into its Preliminary Engineering Phases, with committees and Task Forces created or deleted as the need arises.

Sincerely,

Anthony Pangaro

Anthony Pangaro
Development Coordinator

Enclosure

AP/clp

SOUTHWEST CORRIDOR PUBLIC MEETINGS

Working Committee Meetings

August 23, 1973	Agassiz School
September 20	Hennigan School
October 25	Smith House
November 29	Agassiz School
January 17, 1974	Hennigan School
March 14,	Agassiz School
March 6, 1975	Hennigan School
June 4, 1975	(combined with JRTC) CTPS
October 16	Agassiz
November 19	Agassiz
January 8, 1976	Hennigan School
February 3	Haynes House
February 23	Haynes House

Neighborhood Meetings

Roslindale

October 4, 1973	Roslindale Municipal
November 1	Roslindale Municipal
December 4	Roslindale Municipal
January 29, 1974	Ohrenberger School
May 9	Roslindale Municipal
July 1	Ohrenberger School
July 18	Ohrenberger School
October 3	Sacred Heart
October 17	Sacred Heart
March 20, 1975	Municipal Building
October 23	Sacred Heart

Jamaica Plain

February 25, 1974	12 Sedgwick Street
March 11	10 Southbourne Rd.
March 21	Agassiz School
March 26	Agassiz School
April 12	8 Asticou Rd.
April 16	8 Asticou Rd.
June 4	8 Asticou Rd.
June 12	10 Southbourne Rd.
June 13	10 Southbourne Rd.
June 25	10 Southbourne Rd.
August 6	Agassiz School
August 7	J. P. Neighborhood House
October 28, 1975	Agassiz School
October 29,	10 Southbourne School
December 16	Agassiz School
January 13, 1976	Agassiz School
February 19,	Agassiz School

Hyde Park

October 2, 1973	Hyde Park Municipal
October 18	Hyde Park Municipal
November 13	Hyde Park Municipal
December 18	Hyde Park Municipal
January 31, 1974	Hyde Park Municipal
May 14	Hyde Park Municipal
August 28	11 Bunker Street
October 7	Hyde Park Municipal
October 21	YMCA
October 23	Hyde Park Municipal
November 5	Hyde Park Municipal
November 6	Hyde Park Municipal
April 1, 1976	Hyde Park Municipal

Roxbury

December 3, 1973	Smith House
January 2, 1974	Smith House
January 22	Smith House
February 20	Smith House
April 24	United Neighbors
May 13	Harvard Health Plan Building
May 16	Smith House
May 30	St. Francis de Sales
December 10	Smith House
July 1, 1975	Smith House
October 30	Haynes House
December 12	Smith House
January 14, 1976	Smith House

TASK FORCES

Task Force on Technical Assistance

January 24, 1974	Smith House
February 27, 1974	90 Warren Street
March 21, 1974	90 Warren Street

Long Term Planning Task Force

September 6, 1973	Hennigan School
September 11, 1973	Hennigan School
September 17, 1973	Hennigan School
October 1, 1973	85 Vernon Street
October 16, 1973	85 Vernon Street
October 30, 1973	Agassiz School
November 15, 1973	8 Asticou Road
December 11, 1973	8 Asticou Road
January 8, 1974	8 Asticou Road
February 21, 1974	8 Asticou Road
March 4, 1974	8 Asticou Road
July 9, 1974	8 Asticou Road

Task Force on Consultant Selection/Relocated Orange Line

September 5, 1973	27 School Street
September 9, 1973	27 School Street
September 16, 1973	27 School Street
September 30, 1973	27 School Street
September 31, 1973	27 School Street
October 7, 1973	27 School Street
April 9, 1974	8 Asticou Road
April 23, 1974	8 Asticou Road

Commuter Rail Task Force

December 18, 1975	Norwood Town Hall
January 22, 1976	Sharon Community Center

South Cove Tunnel/Back Bay Station Task Force (Commuter Rail Issues)

April 7, 1975	27 School Street
April 30, 1975	27 School Street

Land Use & Maintenance Task Force

September 4, 1973	Hennigan School
September 25, 1973	St. Francis de Sales
October 9, 1973	Hyde Park Municipal
November 8, 1973	8 Asticou Road
January 15, 1974	8 Asticou Road

South End/St. Botolph Street Neighborhood Task Force

October 22, 1973	20 Union Park
August 20, 1974	20 Union Park
November 6, 1975	Mackey School
November 13, 1975	431 Marlborough St.
December 1, 1975	431 Marlborough St.
December 9, 1975	Mackey School
December 18,1975	431 Marlborough St.
December 30, 1975	431 Marlborough St.
January 12, 1976	431 Marlborough St.
January 13, 1976	EOTC
January 20, 1976	Harriet Tubman
February 5, 1976	431 Marlborough St.
February 12, 1976	431 Marlborough St.
February 18, 1976	70 St. Butolph
February 24, 1976	64 W. Rutland Sq.
March 3, 1976	EOTC

Open Space Task Force

June 27, 1975	431 Marlborough St.
September 26, 1975	EOTC
October 24, 1975	27 School Street
November 19, 1975	27 School Street
January 6, 1976	27 School Street
January 23, 1976	27 School Street
February 27, 1976	27 School Street

West Roxbury/Roslindale/Needham Transportation Improvements Task Force

March 7, 1974	Ohrenberger School
October 15, 1974	Selectman-Needham Town Hall
October 30, 1974	VFW Post
October 31, 1974	Needham DPW Bldg.
November 21, 1974	Ohrenberger School
January 21, 1975	Needham Town Hall
January 30, 1975	West Roxbury Little City Hall
February 27, 1975	Needham Town Hall
March 20, 1975	Needham Town Hall
May 1, 1975	Roslindale Little City Hall
January 28, 1976	Ohrenberger School

COPY

The Commonwealth of Massachusetts
Office of the Secretary

PAUL GUZZI
Secretary of the Commonwealth

Massachusetts Historical Commission
294 Washington Street Boston, Massachusetts 02108
(617) 727-8470

January 28, 1976

HARRIS-BOSTON
JAN 30 1976

Mr. Robert Kiley
Chairman, M.B.T.A.
45 High Street
Boston, Massachusetts 02110

Re: Southwest Corridor, EIA
(Orange Line Relocation - Forest Hills/South Cove)

Dear Mr. Kiley:

The overall proposal for the above project was presented to me on January 26, 1976. It will need further study by this office, following publication of the Draft Environmental Impact Assessment, before comments, as required under Advisory Council Procedures, can be made. I anticipate future cooperation and coordination with the agencies involved, including UMTA and FHWA, to determine the effect of this project on properties listed in or eligible for listing in the National Register of Historic Places.

I commend the consultants and architects who to date have presented a very viable and carefully conceived proposal.

Sincerely yours,

Elizabeth Reed Amadon

Elizabeth Reed Amadon
Executive Director
Massachusetts Historical Commission
State Historic Preservation Officer

ERA/mw

xc: Mr. Anthony L. Pangaro
Ms. Marcia Myers

CITY OF BOSTON

PUBLIC WORKS DEPARTMENT

ONE CITY HALL SQUARE

BOSTON, MASS. 02201

JOSEPH F. CASAZZA
Commissioner
JOHN F. FLAHERTY
Deputy Commissioner
Telephone 722-4100
Ext. 700

DIVISION ENGINEERS
John F. Flaherty, Sanitary
Frederick L. Garvin, Engineering
Charles M. Martell, Highway
John P. Sullivan, Water
James A. O'Rourke, Sewer

December 16,1975

Mr. Anthony Pangora
Southwest Corridor Development Coordinator
8 Asticou Road
Boston, Mass. 02130

Dear Mr. Pangora:

As per your request at our Traffic Liaison meeting held last Wednesday, December 10th, I am writing to confirm that wherever possible we would like to see a sixteen foot clearance at underpasses and/or overpasses.

It has been our experience that even the State standard of 14' - 6" causes problems on city streets because we have our access to utilities to consider, which is not generally a State problem. Our streets are loaded with sewers, surface drains, water pipes, electric ducts, telephone ducts and other underground installations. Any or all of these have a habit of giving us trouble. Much of the equipment used to fix these needs more than 14 feet and we find that 16 feet, while not ideal, allows the equipment to operate more freely and safely, therefore, at less expense.

Also, this higher clearance allows better sight distance, more daylight and less problems relative to light poles and similar vertical street furniture.

Of course we recognize that sixteen feet, in some places, may be hard to provide for and we are most willing to compromise for any special needs.

Very truly yours,

Frederick L. Garvin

Frederick L. Garvin
Division Engineer

FLG/ejm
cc: J. Galeota, Traffic
A. Howard, BRA

REC
1 1975

MEMORANDUM OF AGREEMENT

This Memorandum of Agreement, entered into as of this 4th day of September, 1974, by and among the Southwest Corridor Working Committee, hereinafter defined and referred to as the "Committee," and the Southwest Corridor Development Coordinator appointed by the Governor of the Commonwealth of Massachusetts, and the following agencies, each of which is represented on the Committee: The Massachusetts Executive Office of Transportation and Construction (EOTC), the Massachusetts Department of Public Works (MDPW), the Massachusetts Department of Community Affairs (DCA), the Massachusetts Bay Transportation Authority (MBTA), the Metropolitan District Commission (MDC), the Metropolitan Area Planning Council (MAPC), the Boston Redevelopment Authority (BRA), the Boston Public Facilities Department (PFD), the Boston Model Cities Administration (MCA), the Boston Model Neighborhood Board (MNB), the Boston Economic and Industrial Commission (EDIC), and the Office of the Mayor of the City of Boston for itself and for the City's Public Works Department, Traffic and Parking Department, Real Property Department, Police Department, Parks and Recreation Department, Office of Public Service, and other City Agencies with operating or planning responsibilities in the Southwest Corridor;

WITNESSETH THAT:

WHEREAS, the Commonwealth of Massachusetts through its Department of Public Works has acquired land in cooperation with the Federal Highway Administration for the construction of the Southwest Expressway (Interstate Highway Route 95 from Canton to the Center of Boston); and

WHEREAS, the Governor of the Commonwealth of Massachusetts announced on November 30, 1972, that this Expressway will not be constructed; and has since acted under the provisions of the 1973

Federal-Aid Highway Act to remove the Expressway from the Interstate System; and

WHEREAS, the Governor and the Mayor of the City of Boston have taken responsibility for the preparation of such land for development compatible with existing adjacent uses and consistent with the needs of adjacent communities and for coordinating the activity of appropriate public and private bodies to develop such land for purposes including mass transit and arterial street improvements; and

WHEREAS, the Commonwealth of Massachusetts has the responsibility to perform certain comprehensive planning and review functions in the disposition and development of large tracts of land no longer needed for highway purposes, involving the use of public funds and affecting the well-being of more than one community; and

WHEREAS, the Governor of the Commonwealth with the approval of the Mayor of the City of Boston has appointed a Development Coordinator for the comprehensive development of said land for transit, arterial streets and other street improvements in and affecting the corridor, and particularly other public and private uses; and

WHEREAS, the Massachusetts Bay Transportation Authority has acquired for transit purposes, in cooperation with the Urban Mass Transportation Administration, land in the Corridor formerly owned by the Penn Central Railroad and/or the Boston and Providence Railroad; and

WHEREAS, the City of Boston has the responsibility to perform certain planning functions, to cause certain public improvements to be constructed, and to assess certain taxes in connection with the development of Corridor land within the City and has transportation responsibilities; and

WHEREAS, the Public Improvements Commission of the City of Boston has responsibility for the review of certain projects involving the city property in the Southwest Corridor, particularly those under-

taken by its members, the Public Works Department, the Traffic and Parking Department, and the Real Property Department, each of which has operating responsibilities within the Southwest Corridor; and

WHEREAS, the Public Facilities Department of the City of Boston has certain planning and operating responsibilities that may affect the development of the Southwest Corridor; and

WHEREAS, the Department of Public Works of the Commonwealth of Massachusetts and its Commissioners have certain responsiblities for the development of land in the Southwest Corridor, including the design and construction of highways, interim and permanent disposition of land and the performance of various other functions pertinent to the Corridor; and

WHEREAS, the Massachusetts Bay Transportation Authority has certain responsibilities for the development, operation and maintenance of prospective future mass transportation projects, facilities or services in the Corridor, including but not limited to design and construction of the Relocated Orange Line (Back Bay Station to Forest Hills), removal of the elevated line on Washington Street; and

WHEREAS, the Metropolitan District Commission has responsibility for the development, operation and maintenance of recreation and open space in and affecting the Corridor, and various related functions; and

WHEREAS, the Boston Redevelopment Authority has responsibility for initiating actions necessary for amendments to existing renewal plans and the performance of other planning functions pertinent to the development of the Corridor; and

WHEREAS, the Metropolitan Area Planning Council has broad responsibility for transportation and other planning in the Boston metropolitan area; and

WHEREAS, the Executive Office of Transportation and Construction, Metropolitan Area Planning Council, Massachusetts Department of Public

WHEREAS, Massachusetts Bay Transportation Authority, and the Authority's Advisory Board have by means of a Memorandum of Understanding established a procedure for conducting the continuing, comprehensive, cooperative transportation planning process required by Federal law and have created a Joint Regional Transportation Committee to serve as the principal advisory body for transportation planning; and

WHEREAS, the Joint Regional Transportation Committee has created Southwest Corridor Subregional Committee; and

WHEREAS, the Southwest Corridor Development Coordinator and his staff are part of the Central Planning Staff of the Joint Regional Transportation Committee; and

WHEREAS, each of the other signatory agencies and authorities listed above have certain responsibilities affecting the development of the Southwest Corridor; and

WHEREAS, the Governor of the Commonwealth and the Mayor of the City of Boston have agreed that policies governing the development of said land and of transportation alternatives will be determined in a context in which Commonwealth, City and local community interests are fairly represented; and

WHEREAS, certain community organizations, agencies and the Boston Transportation Planning Review have made various proposals relating to the uses of such land; and

WHEREAS, participants from affected communities desire to be represented as members of the Southwest Corridor Working Committee for the purpose of influencing the disposition and development of land in the Southwest Corridor as it affects their communities; and

WHEREAS, various community participants and agency representatives are presently meeting in either general meetings or in "Task Forces" which serve as committees to discuss "Interim Land Use and Maintenance" or "Long Term Planning," all of which meetings are regular and public,

and these participants and representatives desire to make these meetings more formal and to allow continued open and additional participation by community members, regardless of which may or may not witness this agreement; and

WHEREAS, the work of the Task Forces has served to guide the Coordinator in establishing policies in the interest of the groups represented in their membership; and

WHEREAS, the work of the Task Forces is reported at general meetings which serve as forums for discussion and opinion; and

WHEREAS, membership in the Task Forces has been open to all; and

WHEREAS, it is understood by all parties to this agreement that none of the signatory public agencies or authorities makes any agreement inconsistent with its statutory responsibilities and limitations;

NOW THEREFORE, in consideration of the mutual covenants and obligations contained herein, the Committee, Authorities, and said agencies and departments of the Commonwealth and the City of Boston do agree as follows:

I. WORKING COMMITTEE AND NEIGHBORHOOD COMMITTEES:

A. That the Southwest Corridor Working Committee (the "Committee") shall consist of the Coordinator, representatives of the public agencies enumerated above, representatives of participating community groups, and participating citizens, all of which shall be signatories or witnesses to this agreement.

B. That the Committee will work with the Coordinator to formulate plans and procedures for the overall development of the Southwest Corridor, which will be presented as recommendations to the Governor of the Commonwealth and the Mayor of the City of Boston and to appropriate public agencies.

C. That, for the purposes of approval of transportation plans and to meet Federal requirements for coordinated local review and approval of such plans, the Committee shall function as a sub-committee of the Joint Regional Transportation Committee's Southwest Corridor Subregional Committee.

D. That the EOTC, MBTA and the MDPW agree to use the Committee as an advisory body as they prepare plans for and implement projects in the Corridor assigned to them by statute.

E. That membership on the Committee means attendance by representatives or their specified alternates on a regular and responsive basis, as defined by the Committee, and the gathering and dissemination of information from and to the community groups and public agencies so represented.

F. That the Committee shall be presided over by the Coordinator, and that conclusions shall be reached on a consensus basis so far as possible. No decisions will be reached through voting. When the Committee reaches a consensus, the Coordinator and his staff will abide by the consensus and present it as the Committee's recommendation to the Governor. When there is no consensus, the Coordinator will, after full discussion of the issue, present his own recommendations, along with summaries and identification of sources of the principal opposing points of view, to the Governor, Mayor and other officials as appropriate.

G. It is understood that although the EOTC, MDPW and MBTA must follow procedures established by law in developing and obtaining approvals of plans and implementing projects assigned to them in the Corridor, every consideration shall be given to such a consensus and to such recommendations as the Coordinator may make to the Governor, Mayor and other officials as appropriate.

H. That the Committee and public agencies represented in its membership will coordinate their activities in the Southwest Corridor and in particular that those City and Commonwealth agencies with planning,

construction maintenance or other operating responsibilities within the Corridor will keep the Committee well informed of intentions, plans or advice for the activities within the Corridor, and that no projects will be undertaken or planned without such disclosure. The most important such agencies are the MBTA; the MDC; the MDPW; the BRA; the Office of the Mayor of the City of Boston, and the City's Public Works Department, Traffic and Parking Department, Public Facilities Department, the Parks and Recreation Department, the Office of Public Service, and other city agencies with operating or planning responsibilities in the Southwest Corridor.

I. That the members of the Committee will be informed of the nature of and have full access to all public documents concerning any interagency agreements or other cooperative ventures pertinent to the Corridor's development that are undertaken by the public agency signatories to this agreement.

J. That in addition to the discussions of Southwest Corridor development within the Committee, the coordinator will consult with various "Neighborhood Committees" as to the disposition of specific parcels of land and other issues pertinent to the development of their neighborhoods. Such committees are expected to form in Roxbury/South End/Mission Hill, Jamaica Plain, Roslindale, Hyde Park and otherwise as seems appropriate.

K. That the Coordinator will disseminate information concerning the Committee's work and other aspects of development planning within the Southwest Corridor to the public at large through newspapers and by other appropriate means.

L. That it is understood the Committee's function is advisory and that this agreement is a procedural statement.

II. INTERIM USES, PROPERTY MANAGEMENT AND EXCESS PROPERTY SALE:

A. That general policy recommendations for the temporary use of state land or buildings, long-term or permanent disposition of state-owned land or buildings, and relocation shall be defined by the Committee

and the Coordinator, subject to constraints imposed by law and the Coordinator's right to make recommendations in the event of failure in reaching a consensus.

B. That the Coordinator will examine state-owned Corridor properties in order to determine which should be reserved for future transportation, land-use or other public needs and which are excess and may be sold or leased on a long-term basis, and make appropriate recommendations to the DPW.

C. That the appropriate local Neighborhood Committees will advise the Coordinator on specific vacant land disposition for long-term land use and sale, and the Coordinator will advise the MDPW of same.

D. That the Coordinator will plan means of notifying appropriate public agencies, community groups, businesses and citizens of the availability of state-owned property within the Corridor for temporary use, sale or long-term lease.

E. That the Coordinator will request that the Massachusetts Department of Public Works execute such temporary uses, sales or long-term leases for excess buildings only according to guidelines formulated by the Task Forces and the Committee.

F. That no land or building property sale, use, demolition, relocation or other improvement shall be undertaken in the Southwest Corridor right of way by the Massachusetts Department of Public Works, Massachusetts Bay Transportation Authority or other agency without the knowledge and advice of the Coordinator.

G. That the Department of Public Works and the Massachusetts Bay Transportation Authority will submit appropriate budgetary requests to cover the cost of such maintenance as may be required of state and Authority-owned property respectively, within the Southwest Corridor. The Department of Public Works and Executive Office of Transportation and Construction shall use their best efforts to obtain funds to cover such requests.

H. That the Department of Public Works and Massachusetts Bay Transportation Authority will devote funds available from their respective pro-

perty management and maintenance budgets to Corridor Maintenance within their jurisdiction as recommended by the Coordinator and as available.

I. That temporary uses shall benefit Corridor communities by providing, wherever feasible, employment for local residents, or preferences for local merchants and businesses, local residents, or community service agencies; that such uses will not conflict with pre-existing development plans, will carry appropriate assurances of temporariness, will contain no new permanent structures, will be compatible with existing adjacent uses, and will be subject to appropriate review for public purpose considerations by the Coordinator. The Coordinator, with the guidelines of the Task Force on Interim Land Use, the Committee and appropriate neighborhood committee, shall determine which conditions or terms shall be included in each lease or other agreement that may provide for interim use and recommend same to the MDPW.

J. That the Coordinator will review Commonwealth and City proposals or projects for capital or infrastructure improvement or development in order to assess their compatability with proposed interim uses in order to coordinate such uses with the permanent projects.

III. SCOPE OF WORK:

A. That the Coordinator shall prepare and recommend to the Governor and the Mayor a plan for the development of the Corridor utilizing the studies as prepared by community organizations, the Boston Transportation Planning Review, the Coordinator's Staff, consultants employed by the Massachusetts Bay Transportation Authority and the Department of Public Works, and the Coordinator.

B. It shall be the joint responsibility of the Coordinator, the MBTA and the MDPW to assure mutual consistency between the plans prepared by him and those prepared by the MBTA and the MDPW for projects under their jurisdiction and between the recommendations made by the Coordinator and programs submitted by the MBTA and MDPW for funding by Federal agencies.

C. That the Coordinator shall cause to be made in cooperation with

the Massachusetts Bay Transportation Authority and the Department of Public Works all studies necessary to prepare such plan, including but not limited to 1) analysis of the probable impact of development of the existing cleared land within the Corridor on surrounding communities; 2) probable impact of mass transit and arterial street proposals for the Corridor, including condemnation, advance acquisition of land for transit station development, and the economic and social consequences of joint transit station development; 3) required public policies, including but not limited to zoning, density regulation, eminent domain, comprehensive development strategies, development entities, transit station development districts, building code, and other policies required to maintain the geographic and social integrity of Southwest Corridor communities.

D. That such studies shall include a review of pending legislation applicable to the development of the Corridor, including but not limited to development corporations, minority set-aside legislation for state contracts, instruments for delivering financial assistance to minority businesses, community development corporations, and community economic and social developers.

E. That such studies shall include analyses of the potential for both private and public investment in the Corridor.

F. That the Coordinator shall propose to the Governor and the Mayor the powers and organization of a development entity or entities to oversee Corridor development together with drafts of such legislation as may be necessary for their creation.

G. That the representation of Commonwealth, City and local community interests shall be preserved in the policy-making structure or governing body of such entity or entities.

H. That contracts will be let to cover technical studies, and capital funded engineering for the relocated Orange Line, removal of the Washington Street Elevated, South End and Roxbury replacement service, arterial and local street improvements and feasibility studies for the proposed cross-

town transit facility upon receipt of Federal financial assistance. It is intended that these will be structured so as to permit the completion of South End and Roxbury replacement service to Dudley Station prior to the demolition of the Washington Street Elevated from downtown to Dudley Station. This is to assure adequate mass transit services to communities now dependent upon it.

I. That all such studies will be undertaken with the full participation of the Coordinator and the Committee, and will seek to optimize the comprehensive and joint development potential of land contiguous to and capable of association with the final transit station placements and other transportation uses. Such studies will also consider the economic development needs of the neighborhoods affected.

J. That Massachusetts Bay Transportation Authority and Department of Public Works, will process, with the full participation of the Coordinator, all necessary federal applications for funding of technical work and capital improvements for transit and street improvements, respectively.

K. That the Metropolitan District Commission will cooperate with the examination of potential for provision of permanent recreation facilities in the Corridor and may agree to provide such facilities.

L. That the Boston Public Facilities Department will cooperate with the examination of potential for provision of permanent recreation facilities in the Corridor and may agree to provide such facilities.

IV. EMPLOYMENT POLICIES:

A. That the Commonwealth's Equal Employment Opportunity Plan (also known as the "Altshuler Plan"), establishing minimum floors for minority hiring on state contracts within the Boston minority community, shall apply to all construction contracts which will affect the carrying out of interim and permanent development of the Southwest Corridor lands in communities described in that Plan.

B. That additional and innovative steps will be taken to supplement existing training and programs for minority access to construction and demolition projects in the Southwest Corridor and that where the need is demonstrated, such new training programs as may be feasible will be devised and implemented.

V. CONTRACT POLICIES

A. That the Committee shall review and comment upon, prior to issuance of all Scope of Services statements, or requests for proposals, and shall comment, prior to contract signing, as to the prime contractors for studies and provision of services as they relate to the Southwest Corridor.

B. That 10 percent of the planning and 5 percent of the basic design contracts let for the Southwest Corridor shall be designated for community participation and technical assistance as consistent with guidelines approved by the Joint Regional Transportation Committee. This will apply to all contract work of a transportation or development nature.

VI. OTHER AGREEMENTS

That subject to the examination of alternatives as required by Federal environmental regulations and contingent upon receipt of Federal approval it is intended that the proposed actions will be consistent with the following preferences expressed by the Governor and Mayor:

1) Subject to design and engineering refinements as to the exact points of depressions and demolition, the Jamaica Plain and Roxbury segment of the Penn Central Embankment will be demolished and the new tracks for the relocated Orange Line and railroad will be depressed.

2) At least that portion of the proposed local street arterial from Jackson Square to Ruggles Street will be examined in its potential for construction over the depressed Orange Line and railroad tracks.

3) Eight transit stations will be located in the general areas of Back Bay, Massachusetts Avenue, Ruggles Street, Roxbury Crossing, Jackson Square, Boylston Street, Green Street and Forest Hills and that such stations will be constructed over the transit and railroad tracks.

VII. TIMETABLE FOR COMMENCEMENT OF WORK

A. Technical studies of the replacement service for South End and Roxbury will be conducted concurrently with preparation of plans for the relocation of the Orange Line subject to Urban Mass Transportation Administration approval.

B. A public hearing for federal capital assistance on the relocated Orange Line will be held as expeditiously as possible subject to necessary federal approval.

C. Land development plan framework will be complete as expeditiously as possible.

VIII. SEPARABILITY

A. Any clause herein which is inconsistent with the statutory responsibilities and limitations of any of the Agencies is null and void with respect to that Agency.

IX. EFFECTIVE DATE

A. This agreement is effective immediately upon signature by all the Agencies and shall have effect until the construction of the transit facilities contemplated herein.

Commonwealth of Massachusetts

Sept 4

Francis W. Sargent, Governor (DATE)

City of Boston

Kevin H. White, Mayor (DATE)

Executive Office of Transportation & Construction

Alan Altshuler, Secretary (DATE)

Southwest Corridor Development Coordinator

9/4/74

Anthony Pangaro, Development Coordinator (DATE)

Massachusetts Department of Community Affairs

Lewis S. W. Crampton, Commissioner (DATE)

Massachusetts Department of Public Works

9-4-74

Bruce Campbell, Commissioner (DATE)

Massachusetts Bay Transportation Authority

John J. Doolittle, Chairman (DATE)

Metropolitan District Commission

1/31/75

John W. Sears, Commissioner (DATE)

Boston Redevelopment Authority

Robert T. Kenny, Director — 23 OCT 74 (DATE)

Boston Model City Administration

Paul Parks, Administrator — (DATE)

Boston Model Neighborhood Board

Iris M. Thompson — 11/14/74

[redacted]

Iris M. Thompson, Chairperson — (DATE)

Boston Economic Development & Industrial Commission

Gerald Bush, Director — 11/21/74 (DATE)

Public Facilities Department

Robert J Vey — 10/22/74

Robert Vey, Director — (DATE)

The responsibilities of the undersigned community signatories are limited to only those responsibilities contained in Part I, Section E, herein, and it is the intention of the parties that no other liabilities, obligations, or responsibilities, legal or equitable shall be implied from this agreement.

NAME	ORGANIZATION	DATE
Joseph C. Smith	L.R.C.C.	9/4/74
Barbara Last	J.P.APAC. + L.S.N.A.	9/4/74
Rev William H. Mullin	Ecumenical Social action Committee	9/4/74
Deborah Knight	J.P. Transportation Committee	9/4/74
Francis Mahoney	Jamaica Pond Association	9/4/74
Richard H. Potter	Cooper Community Center	9/4/74
Richard C. Pierce	Greater Roxbury Chamber	9/4/74
George T. Fedder	Hyde Park Board of Trade	9/4/74
Marvin E. Gilmore Jr.	Community Development Corp of Boston	9/4/74

NAME	ORGANIZATION	DATE
Edward H. [illegible]	Southwest Comm. Land Dev. Corp.	9/4/74
[illegible]	[illegible] Home Owners [illegible]	9/4/74
Margaret R. Kane	Roslindale First	9/4/74
Kevin P. Malley	Woodbourne Assoc	9/4/74
Herbert W. Meyer	Mystic R. W. A.	9/4
Walter H. Holcombe	Neponset Conservation Assoc.	9/4/74
Peter [illegible]	[illegible] Comm. on Transportation	9/5/74

Replacement Sum

FREDERICK P. SALVUCCI
SECRETARY

The Commonwealth of Massachusetts

Executive Office of Transportation & Construction
One Ashburton Place
Boston, Massachusetts 02108

January 5, 1976

Mr. Michael Kane, Administrator
SEPAC
374 Columbus Ave., Boston, Ma.

Ms. Ann Hershfang, Member
SECOT
64 West Rutland Sq., Boston, Ma.

Dear Ann and Michael:

Thank you for your letter of December 23, 1975. I am happy that you continue to support the goals for land development in Roxbury and Jamaica Plain. As you know, these depend on the relocated Orange Line.

It is the Commonwealth's and the City's policy that a Relocated Orange Line will be built that maximizes the benefits and minimizes the harmful impacts for the affected communities such as the South End. To that end the Frederic R. Harris Company is under contract to the MBTA to provide both an Environmental Impact Analysis and additional technical work to further the project. Please understand that while the E.I.A. must consider and describe all feasible alternatives to the proposed project, it is intended to build upon, and not reinvent the considerable work of the BTPR, which included the participation of many SEPAC and SECOT members. In addition, there are levels of detail which your letter describes which cannot be within the scope of the present work but more rightly belong to the "P.S. & E." (Plans, Specifications and Estimates) Phase, once a project has been accepted and the Capital Grant received.

The purpose of the current work, then, is to update the consideration of alternatives for the Relocated Orange Line, assess the impacts of those alternatives, and describe the measures which would minimize harm. The Capital Grant Application will describe the measures which the MBTA proposes to employ in that project.

It is my expectation that these same measures will be used to reduce the impacts from existing facilities as part of the Orange Line relocation. Existing Mainline railroad operations and, to an extent, traffic on the Mass. Turnpike will be considered in the E.I.A. Similarly, the project will make preparations for the use of new and less noisy equipment (the new 65-foot Orange Line cars and electrified railroad trains), however, the project cannot

be made dependent upon this new equipment, especially since AMTRAK's plans are beyond the scope of state initiative. The E.I.A. will analyze the impacts of both old and new equipment upon existing and proposed land use, and consider the effectiveness of noise barriers for the impacts of each.

The work necessary to complete this Environmental Impact Analysis will be done. To the extent that any questions of yours or others are not answered in the published Analysis in preparation for the Public Hearing in March of 1976, questions raised at that hearing must be answered as part of the Final Capital Grant Application submitted to UMTA. From this standpoint the question of money now allocated to South End work is important. In addition, weekly meetings are now being held with a South End Task Force to resolve these issues.

The Southwest Coordinator, Tony Pangaro, will continue to be responsible for coordination and follow-up of these items and will direct the work of the MBTA in all Capital Grant Applications. Chairman Kiley, the Governor and I will make the final decisions as to which alternatives are considered and the recommended program prior to the public hearing. The community can state its views and preferences anywhere during the process: at South End Task Force meetings, at South End Neighborhood meetings, and at the Public Hearing. Sections of the Orange Line E.I.A. will be made available to the South End Task Force as they are drafted in advance of the published date.

You raise the issue of the South End Replacement Service for consideration as part of the relocation of the Orange Line. It has been my understanding that you were in agreement with the old decision that the service for the Washington Street corridor in the South End would become the subject of a major environmental impact analysis. This separate E.I.A. would determine its precise nature and will begin in the coming weeks; the MBTA and citizens on the Consultant Selection Committee will chose the consultant on January 9 (Clark Frazier of SEPAC serves on the Committee). At a meeting held just before Christmas at the State House, at which you were in attendance, Ann, I agreed to commit funds adequate to construct a replacement service as decided upon in the E.I.A. from the monies available as the result of escalation in the Interstate Transfer account. In this way an adequate replacement service for those dependent upon the existing El is assured.

You should also be pleased to learn that progress has been made in advancing the cross-town section of the new street in the Southwest Corridor. FHWA now indicates that it may process this portion of the street separately from the Relocated Orange Line (the north-south portion paralleling the Orange Line will remain part of the Orange Line's E.I.A.). While this street is

physically located in Lower Roxbury, this means that several benefits accrue more quickly to the South End: Columbus and Mass. Avenues can be down-graded in accordance with the South End traffic plan which intends to divert traffic around the residential South End since intersection revisions change the flow away from Columbus Avenue to the new cross-town street; in addition development of Parcel X52-A and X52-B can now be achieved in a more timely way.

I am confident that we can and will produce an Orange Line project that serves all of the Boston communities through which it passes, and look forward to your continued participation in defining the project, and to your participation in the Replacement Service work.

Sincerely,

Fred P. Salvucci

Frederick P. Salvucci

FPS:bwp
cc: Anthony Pangaro

The Commonwealth of Massachusetts
Executive Office of Transportation & Construction
One Ashburton Place
Boston, Massachusetts 02108

FREDERICK P. SALVUCCI
SECRETARY

12 November 1976

Mr. Anthony Pangaro
Manager of Southwest Corridor Development
MBTA
500 Arborway
Jamaica Plain, Massachusetts 02130

Dear Tony:

I am writing to elaborate upon the Commonwealth's commitment to the South End Replacement Service which is intended to replace and improve the existing service provided by the Washington Street Elevated Orange Line between Dudley Station and Downtown Boston.

The Replacement Service is the subject of a very detailed feasibility and Environmental Impact Analysis soon to commence under your auspices at the MBTA. This analysis will lead to a decision as to the precise mode and physical configuration to be implemented. In view of the substantial prior study and public discussion, it is possible at this time to commit the Commonwealth to the minimum level of service (defined in the Southwest Corridor E.I.A. in terms of frequency and capacity of service), as well as to the Federal funding sources that will be earmarked for capital funding. My previous letter to members of the South End Committee on Transportation and the South End Project Area Committee, dated January 5, 1976 (attached), describes the spirit of this commitment. Because of changing circumstances which affect our ability to "draw-down" Federal funding for transit subjects, I can say at this time that we will apply to UMTA for either Section 3 or Interstate Transfer funds for the construction of the Replacement Service Project which emerges as a result of the upcoming study.

As a further indication of this commitment, the Replacement Service Project will be included as a line item for funding in the "Program for Mass Transportation" to be published by the Commonwealth this coming spring.

I look forward to the completion of the Replacement Service E.I.A. as the next step in this process.

Sincerely,

Frederick P. Salvucci

Frederick P. Salvucci

FPS:bwp

The Commonwealth of Massachusetts
Department of Environmental Quality Engineering
~~Department of Public Health~~

600 Washington Street

Boston 02111

David Standley
XXXXXXXXXXXXXXXXXXXXXXXXXX
COMMISSIONER

January 4, 197~~6~~7

Mr. Kenneth Kruckemeyer
Assistant Manager Southwest Corridor Development
Massachusetts Bay Transportation Authority
500 Arborway
Boston, Mass. 02130

Dear Mr. Kruckemeyer:

This is in response to your recent inquiry relative to the utilization of certain materials as cover for sanitary landfill operations. Please be advised that much of the material you described as anticipated from the proposed project, that of the removal of the present railroad embankment and excavation for depression of the relocated Orange Line and the Mainline Railroad facility, is of such nature that it can be used in conjunction with sanitary landfill operations.

The cover materials generally used at a sanitary landfill are classified for daily, intermediate and final use. All cover material should be of the particular characteristic to perform the function for which it is intended, and all cover material should be well compacted. In addition, cover material shall be free of materials that would attract flies and rodents, free of large objects that would hinder spreading and compaction, and shall not be easily eroded by water or wind. Important functions of daily cover are vector control, litter control, fire break and moisture control. It shall be easily graded and easily handled under freezing conditions. The intermediate cover shall also provide a seal to prevent the percolation of water. Final cover shall support cover vegetation. Additional information in this regard is found in the Department's "Regulations for the Disposal of Solid Wastes by Sanitary Landfill", particularly Regulations 6 and 15. A copy of these Regulations is enclosed for your information.

With regard to your statements concerning the general availability of cover material, there are many sanitary landfill facilities in the Commonwealth which lack sufficient and appropriate types of cover material existing on the site. Consequently, the cover material has to be trucked in and stockpiled on location prior to use.

If you have any further questions or require additional information relative to this matter, please contact this office.

Very truly yours,
For the Commissioner

Vartkes K. Karaian

Vartkes K. Karaian, Chief
Solid Wastes Branch
Division of Air and Hazardous Materials

VKK/crc

Enclosure

h

APPENDIX

Appendix H

NOISE AND VIBRATION IMPACT ANALYSIS

Contents

Appendix H

NOISE AND VIBRATION IMPACT ANALYSIS

This appendix contains supporting information for the noise and vibration impact analysis.

AMBIENT NOISE MEASUREMENT DATA

Fig. H-1 through H-12 presents a summary of the ambient noise data that was obtained at each of the 12 measurement sites. For each site there is:

1. A graph of

   (a) the peak noise that occurred each hour and
   (b) the L_{eq} sound level for each hour.
   Also listed on the graph is the day-night average sound level, L_{dn}

2. A map that shows the measurement site.

3. A summary table that tells the microphone height, the important noise sources at the site, and the peak and L_{eq} noise levels computed for day (7 AM to 10 PM), and night (10 PM to 7 AM), and 24 hours.

NOISE AND VIBRATION IMPACT ASSESSMENT CRITERIA FOR RAILROAD AND RAPID TRANSIT OPERATIONS

The Southwest Corridor Project involves both the relocation of the MBTA Orange Line from Washington Street to the present Penn Central alignment and the construction of a new arterial street that will in some places replace the present Columbus Avenue. The primary federal funding agencies are the Federal Highway Administration (FHWA) and the Urban Mass Transit Administration (UMTA). FHWA has established noise, or vibration, impact assesment criteria or design goals. It is therefore the responsibility of those who are assessing the noise and vibration impacts to select appropriate criteria. The criteria that will be used to assess noise and vibration impacts for railroad and rapid transit operations in the Southwest Corridor, along with the reasons for selecting these criteria, are described in the material which follows.

Beofre discussing noise or vibration levels at which impact may occur it is worthwhile to review the problem and identify different types of possible noise and vibration impacts. Figure H-13 shows the problem in schematic form. There are two paths by which noise or vibration can reach a receiver: (1) through the air, and (2) through the ground. The noise transmitted through the air will be referred to as airborne noise. The ground transmission path is slightly more complicated. Below a frequency of approximately 30Hz (cycles per second), if the vibration level is high enough, a person can sense that his/her body is being shaken. This problem will be referred to as "feelable" vibration. Another problem associated with ground transmission paths is that above approximately 30Hz the vibrating ground can vibrate the walls and floors of a building and cause them to radiate an audible rumbling noise. This will be referred to as groundborne noise. Criteria for each of these three types of potential problems are discussed below. The "feelable" vibration and groundborne noise problems are discussed first, because they are more straightforward.

"Feelable" Vibration

The criterion for "feelable" vibration will be the threshold of perceptibility. Perceptible whole body vibration is distracting and gives a sense of uneasiness, especially in buildings or homes which people expect to be firm and stationary. In more precise terms a curve that defines the "threshold of

perceptible vibration" based on laboratory tests as shown in Figure H-14* will be used to assess impact. If vibration levels are expected to exceed this curve, vibration impact will be indicated.

Groundborne Noise

The Guidelines of the Institute for Rapid Transit will be used to assess impact due to groundborne noise. These criteria are listed in Figure H-15. They were designed to eliminate activity interference; and, therefore, they depend on the indoor use of potentially affected buildings. Similar lists can also be found in other references**. These noise criteria levels are low enough that if a building owner wants to soundproof his building to minimize airborne noise, for example by double glazing the windows, this can be done without high groundborne noise.

Airborne Noise

The approach used for this project to arrive at an airborne noise impact criterion is to examine several pertinent criteria, guidelines, and design goals and to integrate them into one or two useful criteria. The criteria, guidelines, and design goals that were examined are:

1. The Guidelines of the Institute for Rapid Transit (IRT) as they relate to airborne noise;

2. The Noise Standards of the U.S. Department of Housing and Urban Development (HUD);

3. Federal Highway Administration (FHWA) Policy and Procedure Memorandum 90-2;

4. Speech Interference Level Criteria (SIL); and

5. The Fractional Impact Assessment method now under development by the U.S. Environmental Protection Agency (EPA)

Each of the above listed criteria or guidelines is discussed below.

IRT The Guidelines of the Institute for Rapid Transit recommend a peak pass-by sound level of 80dBA or less for urban locations. This level should not be exceeded at the facades of the closest buildings. In some respects this is almost more of a design goal than environmental assessment criteria. It does not for example take into account the number of train passages; surely 25 or more passages per hour are more annoying or disturbing than a single passage. Novertheless, 80dBA does represent a good design goal.

NOTE: 80dBA is approximately the sound level of a bus or a truck on a city street at a distance of 50 feet.

* T. Miwa, "Evaluation Methods for Vibration Effect, Part 8," Ind. Health, 7, 89, 1969.

**For example: L. L. Beranek, Noise and Vibration Control, McGrawHill Book Co., New York, 1971

HUD There are two critical sound levels and corresponding periods of exposure in the HUD standards. A sound level of 65dBA if exceeded for more than eight hours per day or a level of 80dBA if exceeded for more than one hour per day would cause a site to be classified as unacceptable by the HUD standards. Trains along the proposed alignment will not control the sound level for a total duration of eight hours per day, therefore, the sound level of 65dBA is not relevant. In most cases rapid transit trains do not even control the sound level for a total duration of one hour per day, and hence in these cases the HUD standards would not limit train noise. However, with commuter rail, AMTRAK, and the MBTA along the same proposed alignment, the total duration during which trains will control the sound level will be in the vicinity of one hour. Therefore, for this case, if trains did not exceed 80dBA there would be no impact if the assessment was made in terms of the HUD standards.

FHWA Noise impact for highways can be assessed either in terms of the L_{eq} sound level or the L_{10} sound level. The L_{eq} sound level is the equivalent steady sound level that contains as much sound energy as the actual fluctuating sound level. The L_{10} sound level is that level that is exceeded 10 percent of a given time period.

The L_{10} sound level scale is a particularly poor scale for assessing rapid transit noise because it is unlikely in most cases that rapid transit trains will control the noise level for ten per-cent of the time. In terms of the L_{eq} sound level, the FHWA design noise level for residential locations is 67dB. As stated in FHWA Policy and Procedure Memorandum FHPM7-7-3, this design noise level should be satisfied for the loudest hour of the day. Therefore, an L_{ef} of approximately 67dB is also a candidate for rapid transit noise assessment.

SIL A widely used criterion, which forms the basis for several other criteria, is that the sound level be low enough that speech is not interfered with or interrupted. This criterion is often used when other criteria are not available or do not apply. According to the U.S. EPA*, 95 percent sentence intelligibility is possible in typical living rooms and bedrooms at normal voice levels if the steady sound level in the room is 65dBA. Since trains will only be present along the corridor approximatley five percent of the time, allowing peak indoor noise levels of 60dBA during the passage of trains would correspond to less than one-quarter of one percent sentence interference, when averaged over a typical day. Also in Figure D-4 of the cited reference, EPA shows that for an outdoor day-night noise level of 67dB, which next to the rail right-of-way, corresponds approximately to a peak-hour L_{eq} of 67dB, the percentage of indoor speech interference is less than one percent.

On average, according to EPA, the sound level reduction due to houses in cold climates is 17dB with open windows. Therefore, based on accepting a maximum noise level of 60dBA indoors, the corresponding acceptable maximum noise outdoors during a train passage is 77dBA.

EPA The Noise Control Act of 1972 required that the U.S. EPA "define levels of environmental noise requisite to protect the public health and welfare with an adequate margin of safety." In defining these noise levels they first had to pick a noise of the L_{eq} scale known as the L_{dn} scale. L_{dn}, the day-night average sound level, is similar to the L_{eq} sound level except a 10dB penalty is added to the levels occurring at night. There is therefore strong endorsement from EPA to use the L_{eq} sound level to assess impact.

*U.S. EPA; "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with Adequate Margin of Safety," March, 1974.

EPA also now has under development a technique for assessing noise impact known as the Fractional Impact Method (FIM). This technique says that below an L_{dn} 75 dB there is full impact, and at intermediate ranges there is partial impact. This method sums up the total number of people impacted, weighing them according to how fully they are impacted. This technique makes most sense in terms of assessing the overall effect of a project. The important value is the difference in the number of people impacted before the project and the number of people impacted after the project.

Conclusions and Recommended Criteria

First, before trying to reduce all of the above guidelines, standards and design noise levels into a smaller number of useful criteria, it is useful to relate peak pass-by levels to L_{eq} levels. The difference between the peak sound level and the average sound level, L_{eq}, depends on the total duration of sound events during the time period. The average sound level may be 30 decibels less than a single loud event that lasts only a few seconds each hour, but if loud events become almost continuous throughout the hour then the difference between the peak and average sound level approaches zero.

Under the average sound level impact assessment procedure loud events of short duration have the same impact as quieter events of longer duration provided they both contain the same amount of acoustical energy. The following is an example of several events that have the same average sound level but different peak sound levels provided it is otherwise quiet (say less than 55dBA):

Peak Sound Level	Duration
67dBA	1 hr.
77dBA	1/10 hr. = 6 min.
87dBA	1/100 hr. = 36 sec.
97dBA	1/1000 hr. = 3.6 sec.

At present the difference between peak sound levels and average peak hour sound levels near the Orange Line are approximately 17 decibels as measured at Site No. 7 (see Fig. H-7). However, in the design year along the proposed corridor the number of train car passages during peak hour will increase by a factor of four if commuter rail and AMTRAK is included. Thus, since a doubling of the frequency results in a 3dB increase in sound levels, the additional pass-bys would yield a 6dB increase. The difference of 17dB would be reduced to 11dB; or an approximately 10dB difference between peak sound levels and average peak hour sound levels.

Based on the above discussion an L_{eq} sound level of 67dB, calculated at the loudest hour of the day, will be used to assess rapid transit impact at residentail locations. If the energy average noise level at the facade of a building is expected to exceed 67dB, then impact will be noted and it will be recommended that some noise control device or technique be implemented to eliminate this impact.

The L_{eq} 67dB level was chosen because:

1. It corresponds to the design noise levels specified by FHWA for highways.

2. If the L_{eq} sound level of 67dB is not exceeded, then peak pass-by levels will be approximately 77dBA and the HUD noise standards, the IRT Guidelines, and the indoor speech interference criterion will be satisfied.

3. It uses the L_{eq} noise level scale which has been accepted by EPA as an acceptable scale for the measurement of environmental noise.

It may be that some residents near the tracks may still find the L_{eq} 67dB level higher than what they would like. Three points should be considered:

1. The L_{eq} 67dB level was picked because it satisfies the above cited guidelines, standards and criteria. No attempt was made to satisfy personal preferences for residential noise levels.

2. Present peak hour L_{eq} noise levels adjacent to the tracks are approximately 80dB. Therefore, an L_{eq} 67dB level would be a great improvement.

3. The L_{eq} 67dB criterion requires that peak pass-by noise levels not exceed 77dB at 50 Feet. Most large trucks on the streets of Boston would have trouble passing such a criterion. Therefore, a more stringent criterion would be unrealistically severe.

RAIL NOISE PREDICTION MODEL

Noise Emission Levels

In order to predict future noise levels for MBTA operations it was decided to use noise levels measured near the MBTA Red Line extension to Quincy. There are two reasons for using these noise levels: (1) the track here is similar to what is expected for the Orange Line if it is relocated along the Penn Central alignment (welded rail on tie and ballast), and (2) the U.S. Department of Transportation conducted a thorough program of noise measurements along this line* and therefore noise levels are well documented.

The data was first normalized to a single car at 50 feet **, and based on repeated measurements of trains at various speeds a 30 log speed dependence was assumed. The data was then averaged and the following expression was obtained for the peak pass-by noise level of a single car at 50 feet:

$$L_A(50') = 33 + 30 \log_{10}(v)$$

where v is the speed in feet per second. It should be noted that the above expression represents an acoustic energy average of all the data; some trains were as much as ten decibels quieter than what would be predicted by using this expression. The reason for the large variation can probably be attributed to the condition of the wheels. This of course also implies that up to ten decibels of noise reduction from the predicted energy average noise levels could be obtained if the wheels and rail were very well maintained.

In the future it is expected that the wheels of the Orange Line trains will be better maintained than the wheels of the Red Line trains when the above cited tests were conducted. This is because the MBTA has since equipped its maintenance shop with modern wheel truing machines. In order to account for this in the following expression was used to predict the noise level of a single car at 50 feet:

$$L_A(50') = 28 + 30 \log_{10}(v)$$

* "MBTA Rapid Transit System (Red Line) Wayside and In-Car Noise and Vibration Level Measurements," U.S. Department of Transportation Report No. DOT-TSC-OST-72-31, August 1972.

** For the normalization technique see: "Wheel/Rail Noise and Vibration Control," U.S. Department of Transportation Report No. UMTA-MA-06-0025-73-15, May 1974.

In addition to rapid transit trains, the present Penn Central alignment will also carry commuter trains and AMTRAK trains. The noise levels of self-propelled diesel cars (Budd Liners), passenger rail cars and electric locomotives are similar to those for rapid transit cars because the dominant noise source is wheel/rail noise*. Note that wheel flats are not as much of a problem with rail passenger cars as with rapid transit because decceleration rates are much lower and wheel slip is unusual. The same noise level as for rapid transit cars will therefore be used to predict noise from these cars. Diesel locomotives are, of course, considerably louder than rapid transit cars or rail passenger cars. The dominant noise sources of a diesel-electric locomotive are the exhaust and engine casing noise. These locomotives are approximately 10 decibels louder than rapid transit cars or rail passenger cars. They are not as speed dependent, but they are louder when they are under load such as when they are accelerating away from a stop. A source level of 95dBA at 50 feet was used to predict diesel locomotive noise with no speed dependence.

Conversion from Emission Levels to L_{eq}

The energy average sound level, L_{eq}, for the period from -T/2 to +T/2 can be determined using the following equation:

$$L_{eq} = 10 \log \left[\frac{1}{T} \int_{-T/2}^{+T/2} 10^{L_A(t)/10} \, dt \right]$$

where $L_A(t)$ is the instantaneous A-weighted sound level.

The sound level at a distance d, measured in feet, from a track during the passage of a single rail car can be expressed as

$$L_A(t) = L_A(50') + 10 \log \left[\frac{(50)^2}{d^2 + (v\ t)^2} \right]$$

where the time t is taken to be zero when the vehicle is at its closest position (i.e. distance d), $L_A(50')$ is the sound level of a single car at 50 feet, t is expressed in seconds, and v (the velocity of the vehicle) is expressed in feet per second.

The energy average sound level, L_{eq}, due to the passage of a single vehicle in the period T is given by

$$L_{eq} = 10 \log \left\{ \frac{1}{T} \int_{-T/2}^{+T/2} 10^{L_A(50')/10} \left[\frac{(50)^2}{d^2 + (v\ t)^2} \right] dt \right\}$$

If T is much greater than the passage time of the vehicle, this reduces to

$$L_{eq} = L_A(50') + 10 \log \left[\frac{\pi (50)^2}{Tdv} \right]$$

* "Wayside Noise and Vibration Signatures of High Speed Trains in the Northeast Corridor," U.S. Department of Transportation, Report No. DOT-TSC-OST-73-18, September 1973.

If N train cars pass in the time period T, the total acoustic energy goes up by a factor N. Taking this into account and substituting in for $L_A(50')$ gives

$$L_{eq} = 28 + 10 \log \left[\frac{N\pi(50v)^2}{Td}\right]$$

Propagation Effects and Noise Control at The Source

The above method for the prediction of the energy average sound level is only good for open spaces where most of the track can be seen in both directions. Barriers which block the line of sight between any location and the rails also reduce the noise which is received at this location. A method for the calculation of noise reduction due to barriers has been developed for noise predictions near highways, and this method was used to calculate the noise reduction of barriers near the proposed rail alignments.

Two rules of thumb had a major influence on fixing the location of the noise impact contours. The first was that the attenuation of sound with distances, down streets perpendicular to the tracks, was taken to be 4.5 decibels each time the distance from the source was doubled. This is half way between the theoretical minimum of 3 decibels per doubling of distance and the theoretical maximum of 6 decibels per doubling of distance. The theoretical minimum occurs if all the sound energy reflects off the buildings as if they were mirrors; the maximum occurs if the sound is absorbed at the buildings or reflected in random directions. Both of these theoretical extremes have been measured experimentally.

The second important rule of thumb is that the first row of separated houses parallel to the tracks provides a sound level attenuation of five decibels*. Subsequent rows provide an attenuation of 1.5 decibels up to a maximum of ten decibels. Because of this rule of thumb the noise contours frequently stopped at a row of houses. That is, the row of houses closest to the tracks are expected to shield the houses further from the tracks from the noise.

NOISE EMISSION LEVELS FOR TRUCKS

Both of the noise prediction methods approved by the Federal Highway Administration use truck noise emission levels based on measurements of trucks at highway speeds. At such speeds tire noise is usually the dominant noise source, whereas at low speeds noise from the engines and exhaust systems are more important. Using the authorized methods in low speed urban situations can lead to overprediction of future noise levels.

Measurements of trucks in urban traffic for other projects have shown that noise emission levels for medium trucks (two axels) are as much as 12 decibels less than the level in the authorized models, and emission levels for large trucks (three or more axels) are as much as seven decibels less**. The problem is most pronounced in open areas where a ten decibel overprediction of the future

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* "Fundamentals and Abatement of Highway Traffic Noise," Office of Environmental Policy, Federal Highway Administration, U.S. Department of Transportation.

** G. S. Anderson, et.al., "1972 Noise Levels and Noise Model for Urban Truck Traffic--West Side Highway Project," BBN Report No. 2524, 1973.

F. A. Prahl and N. P. Miller, "Noise Model for Slow Speed Trucks on Baltimore City Streets," BBN Report No. 3212, December 1975.

noise level would result in estimating the location of the noise contours ten times as far from the roadway. Such errors could result in costly design changes to abate noise impact that was simply overpredicted, or to seek exceptions where they are unnecessary.

In order to predict more accurately traffic noise levels in the Southwest Corridor, the peak pass-by noise level of 133 trucks and buses were measured in the study area along Columbus Avenue. Based on previous work* it was decided to classify trucks into two classes:

1. Medium trucks - trucks with two axels (excluding pick-ups and small panel trucks which are treated as automobiles)

2. Heavy trucks - trucks with three or more axels.

Such vehicle types are easy to identify in the field, and the standard deviation of the sound levels for each class is much smaller than it would be if all vehicles were included in one class.

The results of this measurement program are shown in the figures which follow. Included is a plot of sound emission level, peak pass-by sound level normalized to a distance of 50 feet, for both medium trucks and large trucks. The emission levels are plotted as a function of log speed, and linear regression lines are fitted to the data. The mathematical expressions for the emission levels are:

$$L = 76 + 1.3 \log_{10} S \text{ for medium trucks}$$

$$L = 68 + 11.3 \log_{10} S \text{ for heavy trucks}$$

where S is the speed in units of miles per hour. The expected speed during peak hour for the proposed arterial is approximately 22mph and the corresponding emission levels for medium and heavy trucks are 77.8dBA and 83.2dBA. This is significantly lower than the 87dBA level in the Transportation Systems Center model. The Highway Research Board model uses in 82dBA truck emission level but adds four decibels for interrupted flow; this gives them an 86dBA emission level in most urban areas. The above expression for heavy trucks does agree with levels from the authorized models at approximately 40mph. However, no actual measurements were made for speeds above 33mph.

The noise emission levels obtained for trucks at urban speeds in this study are a few decibels higher than the levels for trucks measured in the other studies cited above. The expressions for truck emission levels obtained in the Baltimore study, for example, would predict emission levels for medium and heavy trucks of 74.2dBA and 80.0dBA at 22mph. This is about three decibels lower than the average levels measured in Boston. The expressions for truck noise emission levels for the West Side Highway Project were about five decibels lower than those measured in Boston for medium trucks, but similar for heavy trucks.

In order to take advantage of the different levels for the two classes of trucks it is necessary to know the mix ratio of these two types of vehicles. Independent counts of trucks by type were not performed, but during the measurement program the type of each vehicle that was measured was noted. Therefore, some mix information is available. Many medium trucks were not measured because they were in clusters of traffic and it was not possible to measure their noise level without picking up some of the noise from other nearby vehicles. Almost all large trucks were measured. Therefore, the ratio of measured medium trucks is biased in favor of large trucks. This ratio was 3:2. This ratio may also be slightly high for peak hour predictions. One would expect that the relative

* See the previous cited reference.

proportion of heavy trucks would drop off during rush hour. The 3:2 ratio will be used in the predictions; it should be noted that since it is biased in favor of large trucks that a slight overprediction of the expected noise level may result. It is however better to slightly overpredict than to underpredict, and the overprediction will not be nearly as great as it would be if the levels from the authorized models were used. It should also be noted that city buses fall in the medium truck class because they have two axels, and the medium truck emission level will be used to predict future noise levels from them.

CONSTRUCTION NOISE PREDICTION AND CONTROL

The following three tables show the calculations used to predict the construction noise levels discussed in the text. Each type of equipment is assigned a noise level and a usage factor for each phase of the construction. The total sound energy is added up and averaged over the period of construction.

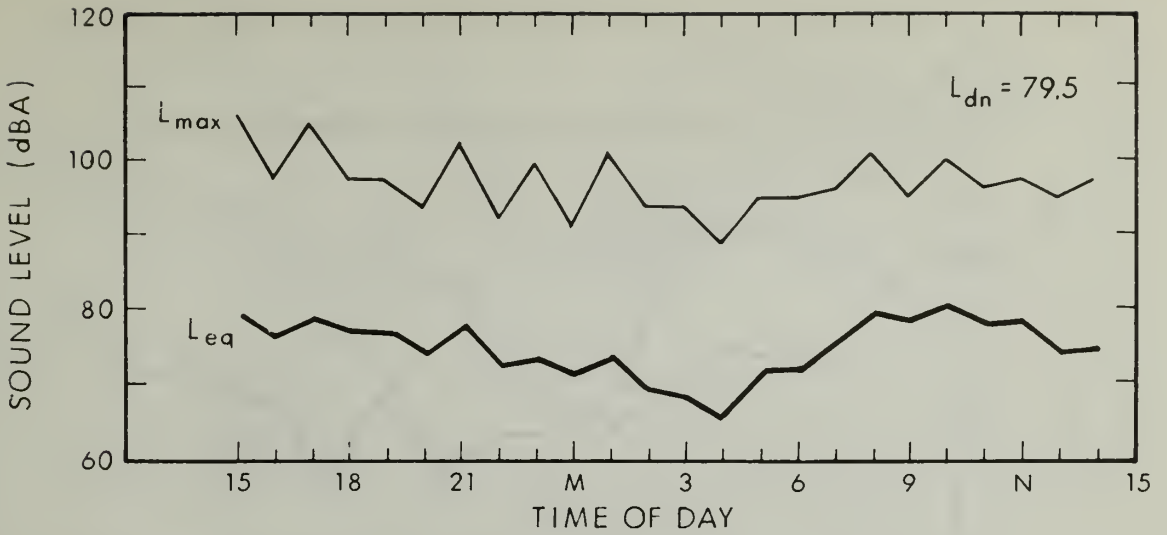
The next five tables provide additional information on the sound level of specific equipment, and the noise reduction that can be obtained without major redesign or extreme cost.

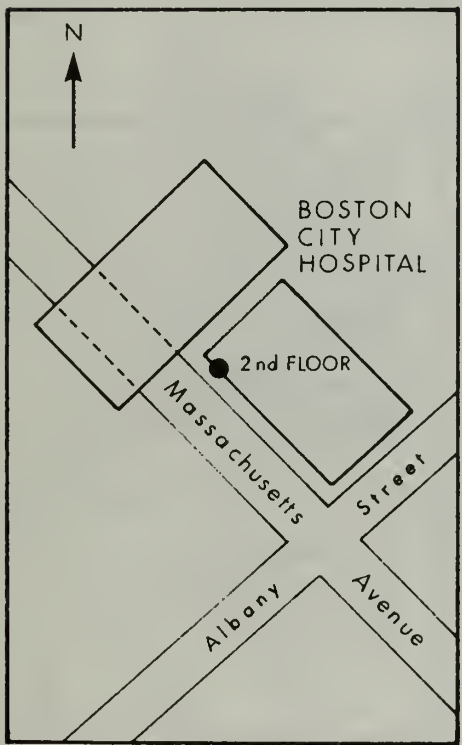
Result of noise mufflers and acoustical enclosures on construction equipments and tools now in use (partial list) are as follows. 1/

Equipment	Device	Before	After	Distance
Pile Driver				
Vulcan 010	none	103 dBA		25 ft.
	muffler on exh. & sound barrier on the leads		85 dBA	25 ft.
Paving Breaker				
Ingersall-Rand Model·SB-8	none	105 dBA		3 ft.
	muffled		100 dBA	3 ft.
	muffled		85 dBA	50 ft.
	plus acous. enclosure		75 dBA	35 ft.
Diesel Drive Electric Welding Machine				
Lincoln Co. Model 400	none	93 dBA		23 ft.
	muffler and plus acous. enclosure		76 dBA	23 ft.

1/ Final Environmental Impact Statement, East 63rd Street, Subway Line, New York City Transit Authority, April 1973.

Equipment	Device	Before	After	Distance
Air Compressor - (Diesel Driven)				
Ingersall-Rand 1200 CFM	none	105 dBA		3 ft.
	muffled		85 dBA	3 ft.
Gardner-Denver 750 CFM	none	103 dBA		3 ft.
	muffled		85 dBA	3 ft.
Air-tracked Drill				
Ingersall-Rand 600 CFM	none	104 dBA		23 ft.
	acous. enclosure		83 dBA	23 ft.
Gardner-Denver	none	104 dBA		23 ft.
	muffled		100 dBA	23 ft.
	plus acous. enclosure		77 dBA	23 ft.
Chain Saw				
Gasoline Driven	none	113 dBA		3 ft.
Elec. Driven	none	86 dBA		3 ft.
		72 dBA		15 ft.





Not to Scale

SITE NO.: 1

LOCATION:
Boston City Hospital

MICROPHONE HEIGHT:
2nd Floor

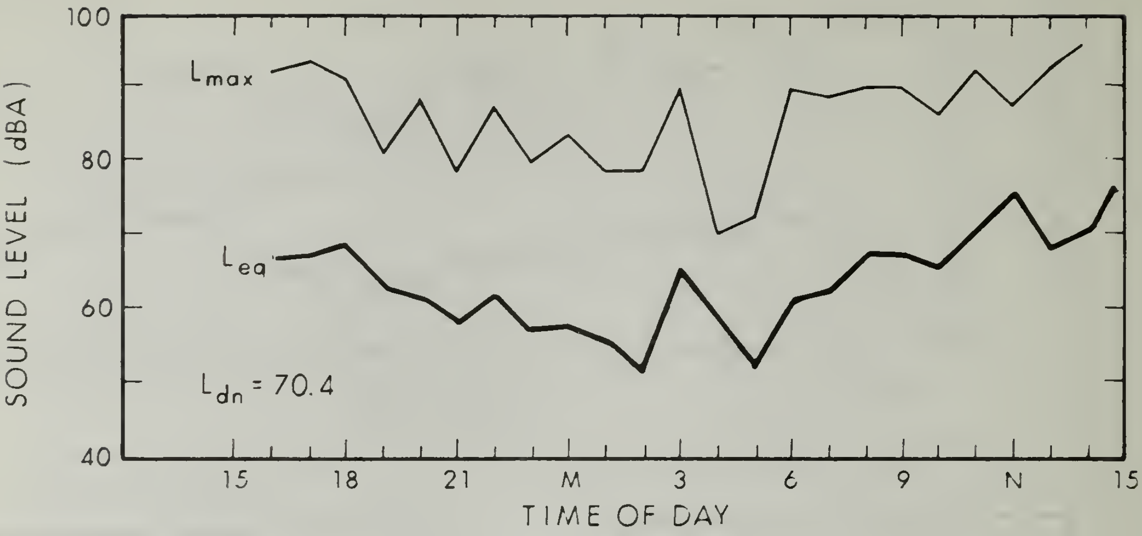
MAJOR NOISE SOURCE:
Mass. Ave traffic

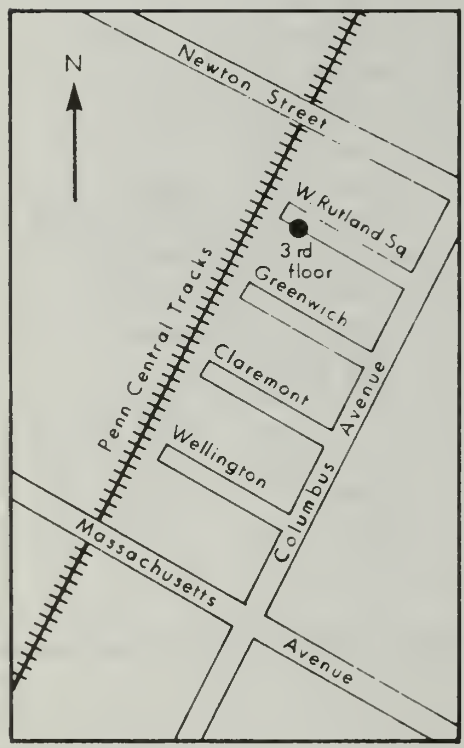
OTHER NOISE SOURCES:
Distant traffic

TIME OF MEASUREMENT:
2PM 8/27/75 to
2PM 8/28/75

	DAY	NIGHT	24 hr.
L_{max}	106	101	106
L_{eq}	77	71	76

(FIG. H-1)





Not to Scale

Site No.; 2

LOCATION:
76 W. Rutland Square

MICROPHONE HEIGHT:
3rd Floor

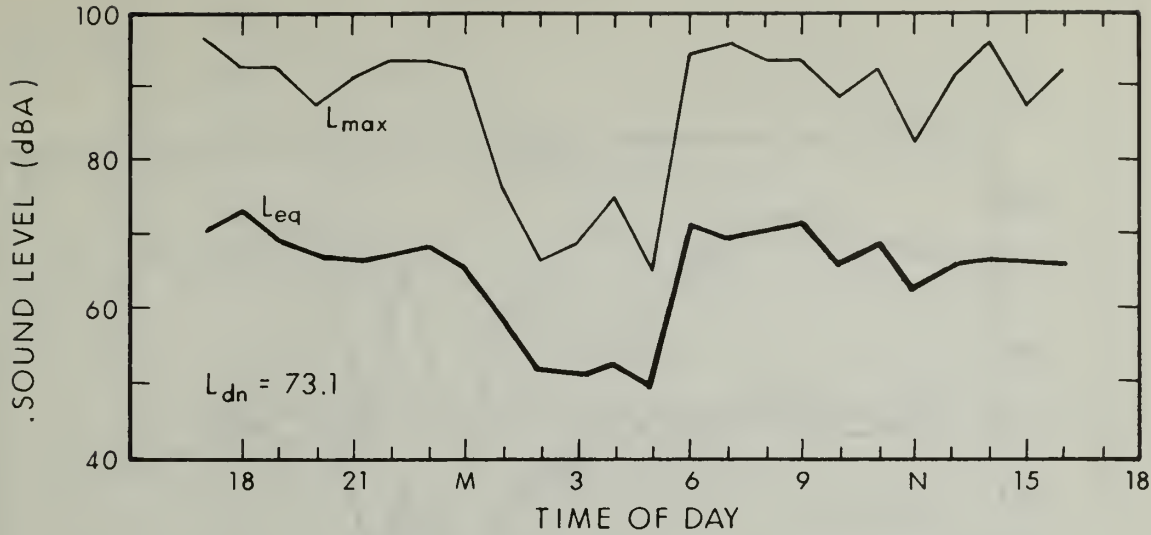
MAJOR NOISE SOURCE:
Columbus Ave. Traffic
Trains

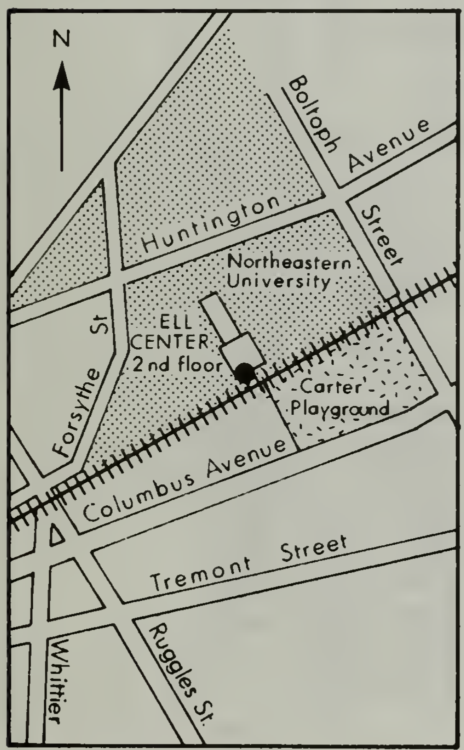
OTHER NOISE SOURCES:
Distant Traffic
Some Construction Noise

TIME OF MEASUREMENT:
3PM 2/26/75 to
3PM 2/27/75

	DAY	NIGHT	24 hr.
Peak	96	90	96
L_{eq}	70	61	69

(FIG. H-2)





Not to Scale

SITE NO.: 3

LOCATION:
Ell Center, Northeastern University (near Carter Playground)

MICROPHONE HEIGHT:
2nd floor

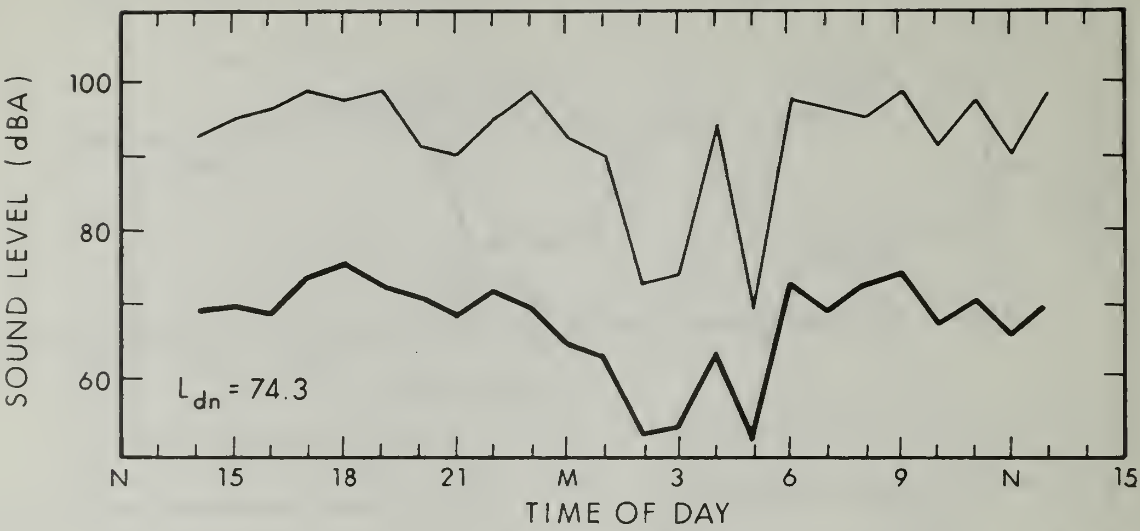
MAJOR NOISE SOURCE:
Trains

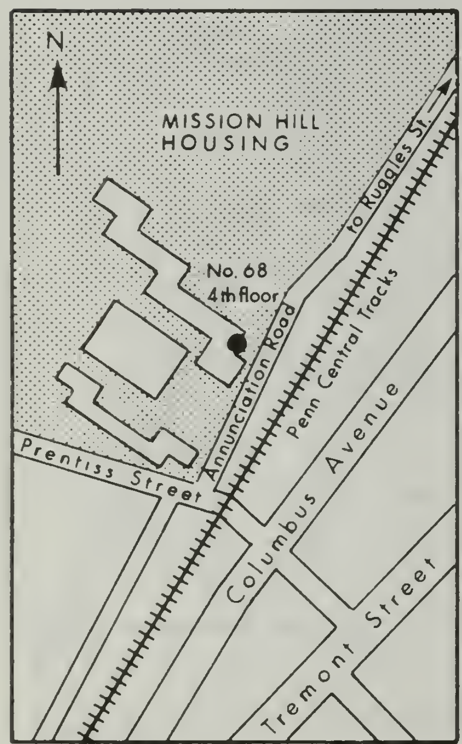
OTHER NOISE SOURCES:
Columbus Ave. Traffic

TIME OF MEASUREMENT:
4PM 9/29/75 to
4PM 9/30/75

	DAY	NIGHT	24 hr.
Peak	96	96	96
L_{eq}	69	66	68

(FIG. H-3)





Not to Scale

SITE NO.: 4

LOCATION:
68 Annunciation Rd.,
Mission Hill Housing

MICROPHONE HEIGHT:
4th floor

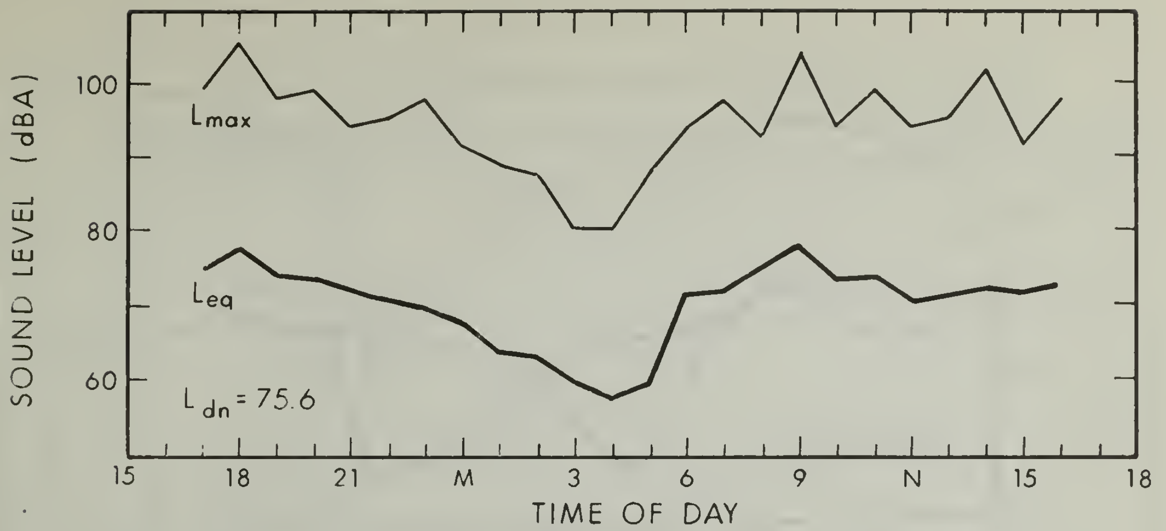
MAJOR NOISE SOURCES:
Trains
Columbus Ave. Traffic

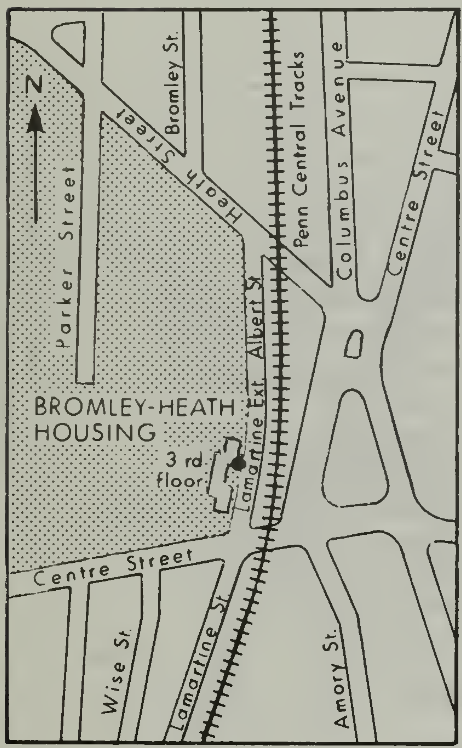
OTHER NOISE SOURCES:
Distant Traffic
Community Noise

TIME OF MEASUREMENT:
1PM 10/16/75 to
1PM 10/17/75

	DAY	NIGHT	24 hr.
Peak	99	99	99
L_{eq}	72	67	70

(FIG. H-4)





Not to Scale

SITE NO.: 5

LOCATION:
Bromely-Heath Housing
(50 Lamartine Ext.)

MICROPHONE HEIGHT:
3rd floor

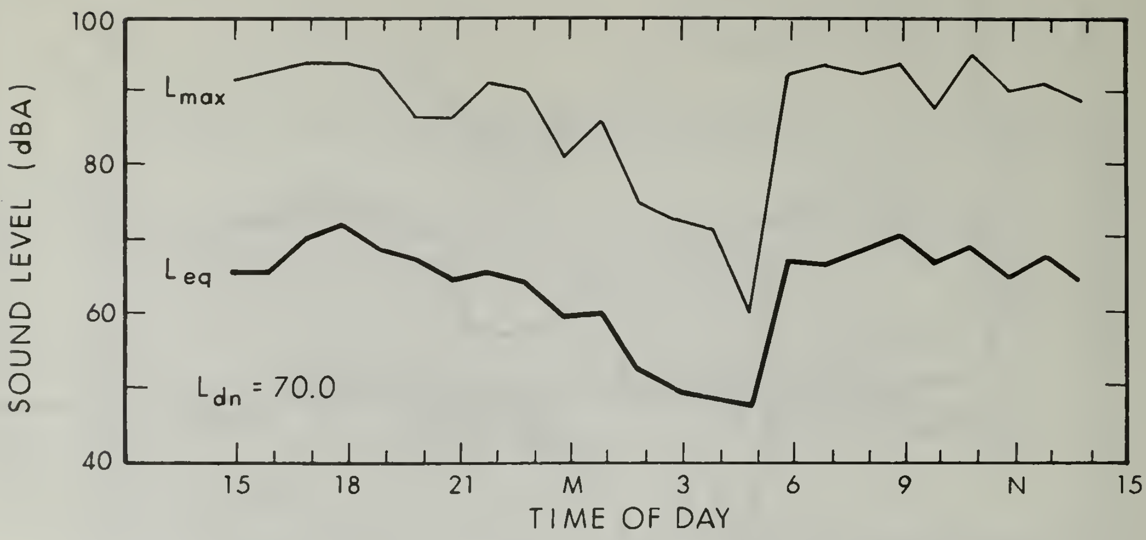
MAJOR NOISE SOURCES:
Trains, Local Traffic

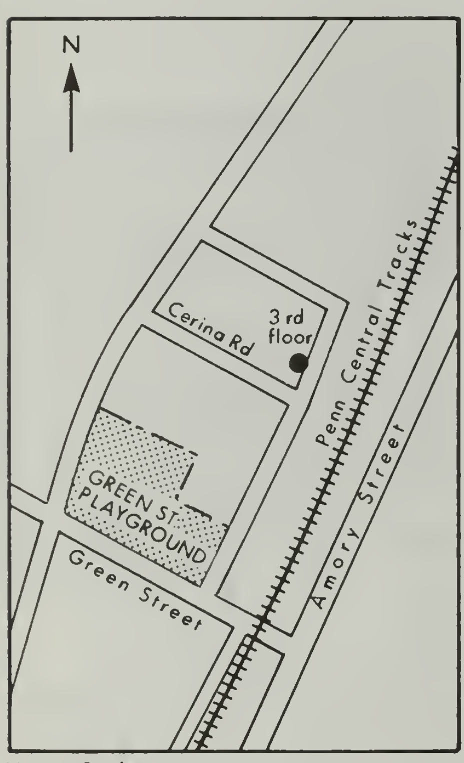
OTHER NOISE SOURCES:
Distant Traffic

TIME OF MEASUREMENT:
4PM 9/22/75 to
4PM 9/23/75

	DAY	NIGHT	24 hr.
Peak	105	98	105
L_{eq}	74	68	72

(FIG. H-5)





Not to Scale

SITE NO.: 6

LOCATION:
7 Cerina Rd.
(near Green St. Playground)

MICROPHONE HEIGHT:
3rd floor

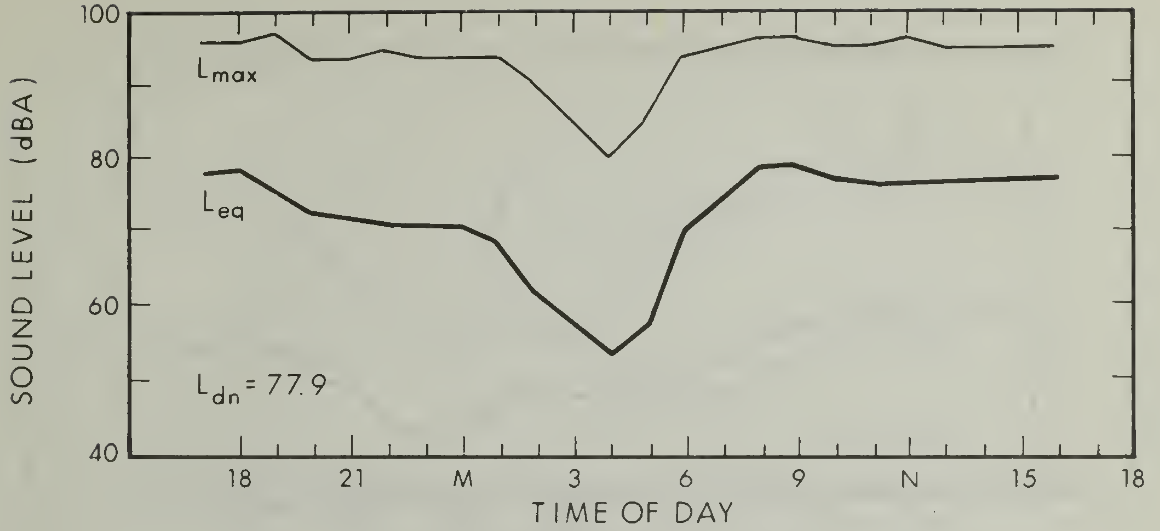
MAJOR NOISE SOURCES:
Trains

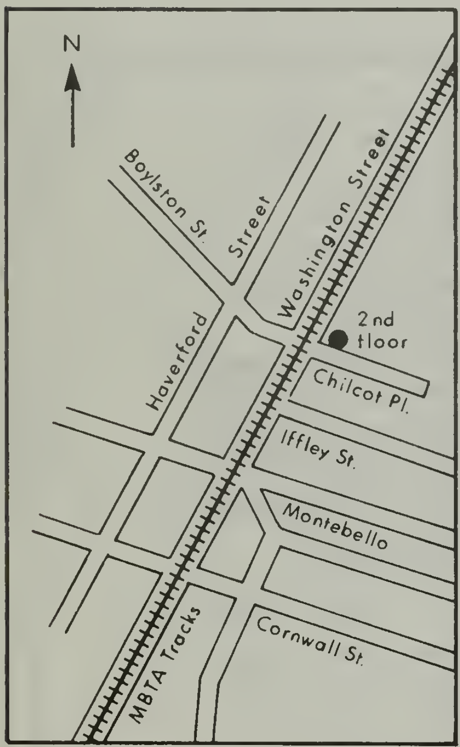
OTHER NOISE SOURCES:
Distant Traffic
Community Generated Noise

TIME OF MEASUREMENT:
2PM 8/26/75 to
2PM 8/27/75

	DAY	NIGHT	24 hr.
Peak	95	94	95
L_{eq}	68	62	67

(FIG. H-6)





Not to Scale

SITE NO.: 7

LOCATION:
6 Chilcot Place

MICROPHONE HEIGHT:
2nd floor

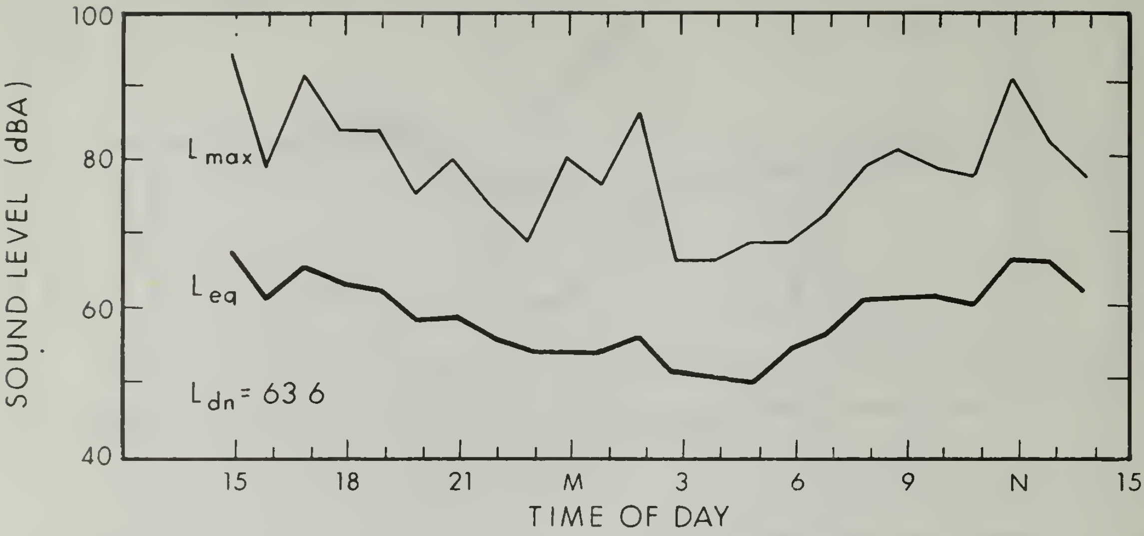
MAJOR NOISE SOURCES:
MBTA Trains
Washington Street Traffic

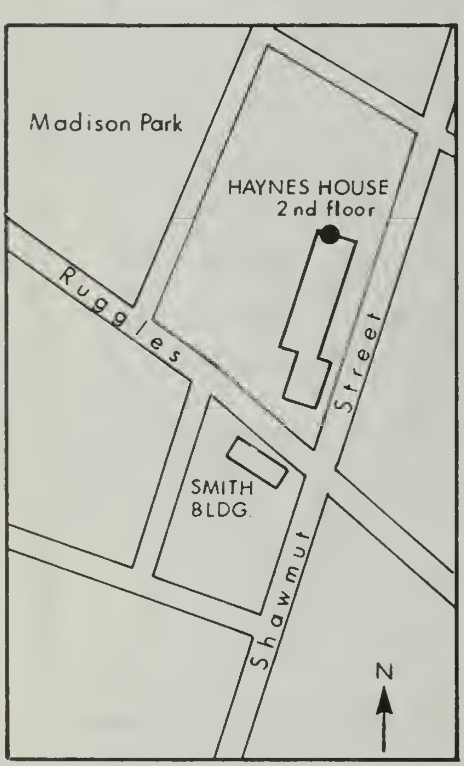
OTHER NOISE SOURCES:
None

TIME OF MEASUREMENT:
4PM 8/25/75 to
4PM 8/26/75

	DAY	NIGHT	24 hr.
Peak	98	95	98
L_{eq}	77	69	75

(FIG. H-7)





Not to Scale

SITE NO.: 8

LOCATION:
Madison Park
(Haynes House)

MICROPHONE HEIGHT:
2nd floor

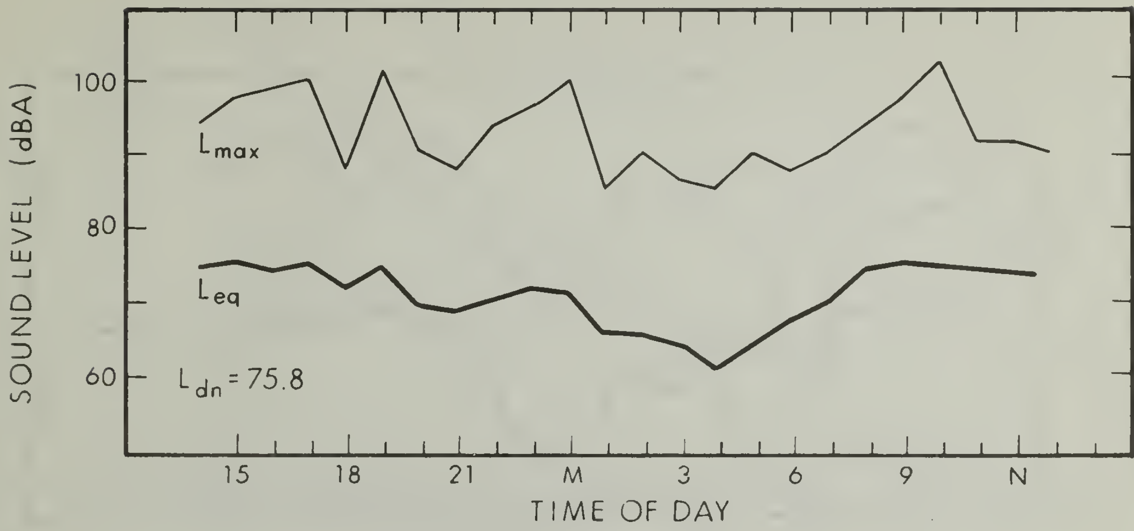
MAJOR NOISE SOURCES:
Shawmut Ave. Traffic

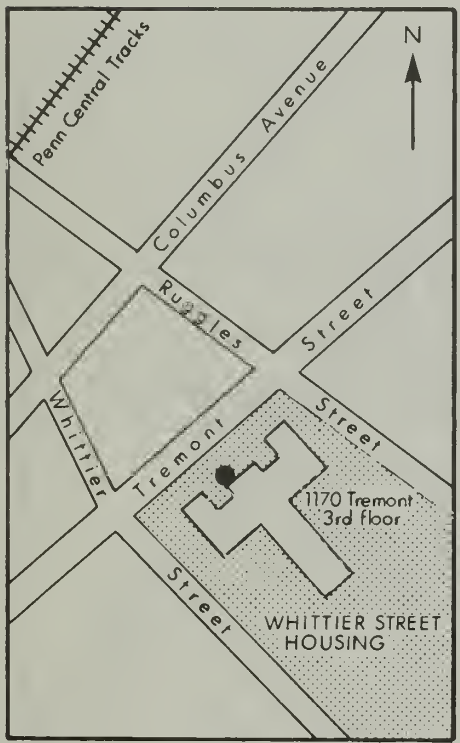
OTHER NOISE SOURCES:
Distant Traffic

TIME OF MEASUREMENT:
2PM 8/28/75 to
2PM 8/29/75

	DAY	NIGHT	24 hr.
Peak	95	86	95
L_{eq}	63	54	62

(FIG. H-8)





Not to Scale

SITE NO.: 9

LOCATION:
1170 Tremont St.
(Whittier St. Housing)

MICROPHONE HEIGHT:
3rd floor

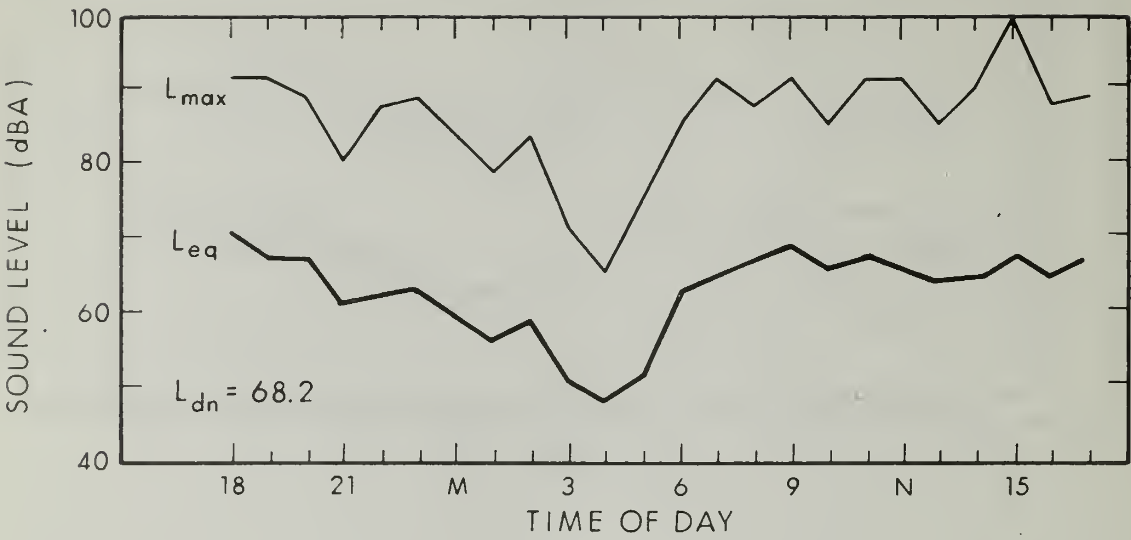
MAJOR NOISE SOURCES:
Trains
Tremont & Columbus Traffic

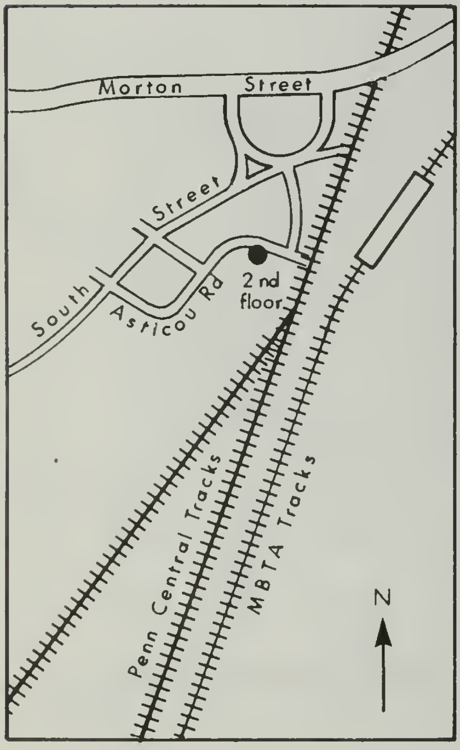
OTHER NOISE SOURCES:
Ruggles St. Traffic

TIME OF MEASUREMENT:
1PM 10/22/75 to
1PM 10/23/75

	DAY	NIGHT	24 hr.
Peak	103	100	103
L_{eq}	74	68	72

(FIG. H-9)





Not to Scale

SITE NO.: 10

LOCATION:
8 Asticou Rd.

MICROPHONE HEIGHT:
2nd floor

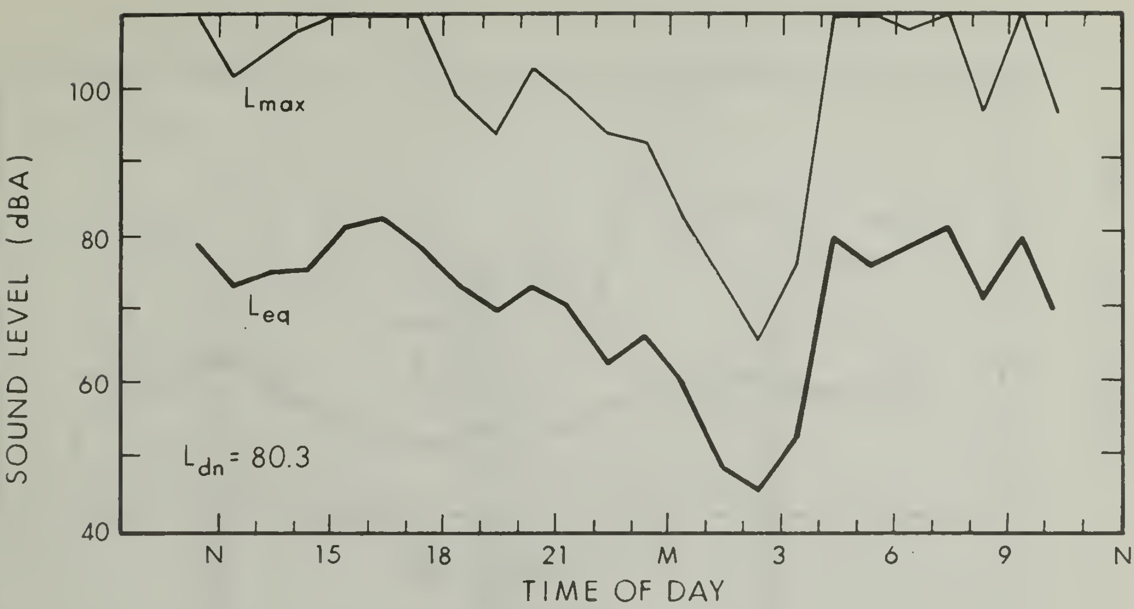
MAJOR NOISE SOURCES:
Trains
Traffic at Corner of
Asticou Rd.& Washington St.

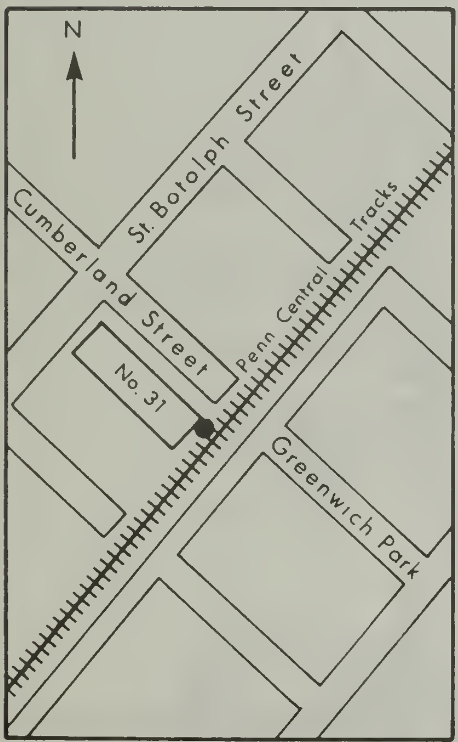
OTHER NOISE SOURCES:
None

TIME OF MEASUREMENT:
5PM 8/25/75 to
5PM 8/26/75

	DAY	NIGHT	24 hr.
Peak	100	91	100
L_{eq}	66	60	65

(FIG. H-10)





Not to Scale

SITE NO.: 11

LOCATION:
31 Cumberland Street

MICROPHONE HEIGHT:
~30 ft. above tracks

MAJOR NOISE SOURCE:
Trains

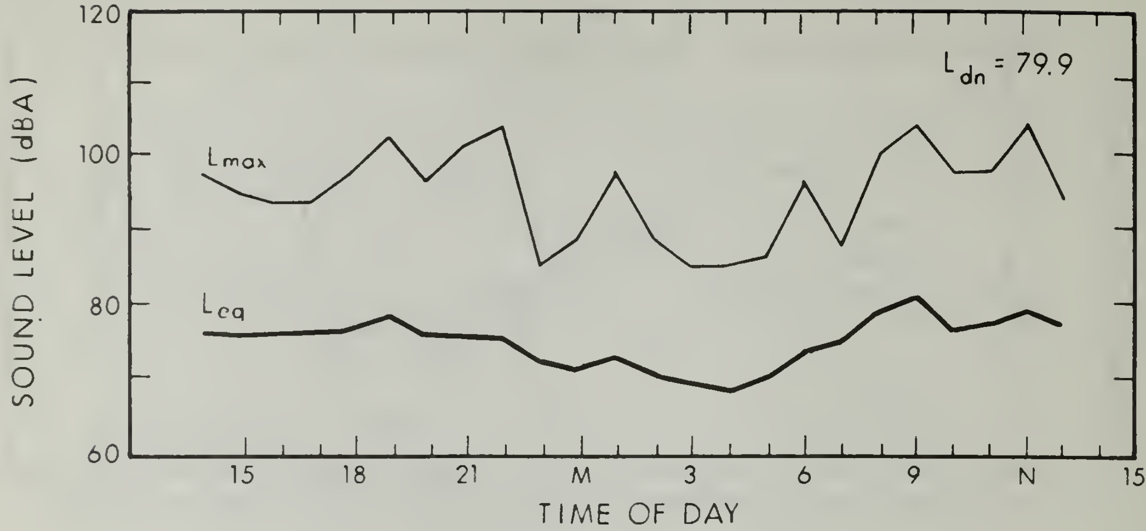
OTHER NOISE SOURCES:
Distant Traffic

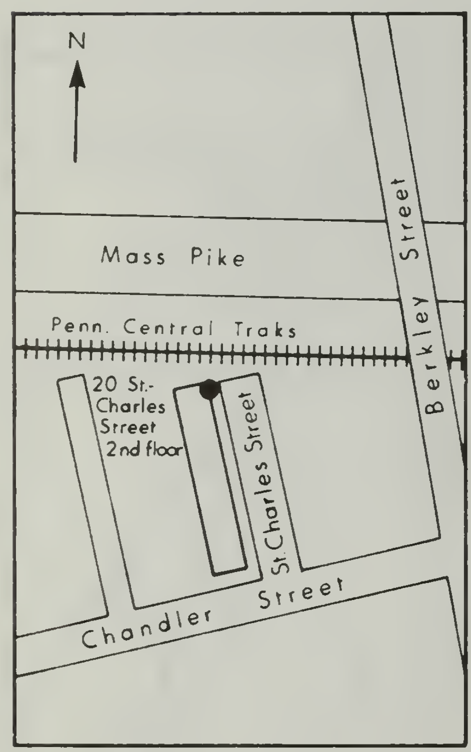
TIME OF MEASUREMENT:
Noon 1/15/76 to
Noon 1/16/76

	DAY	NIGHT	24 hr.
L_{max}*	110.0	110.0	110.0
L_{eq}	78.0	72.5	76.7

*Equipment Overloaded

(FIG. H-11)





Not to Scale

SITE NO.: 12

LOCATION:
20 St. Charles St.

MICROPHONE HEIGHT:
2nd floor

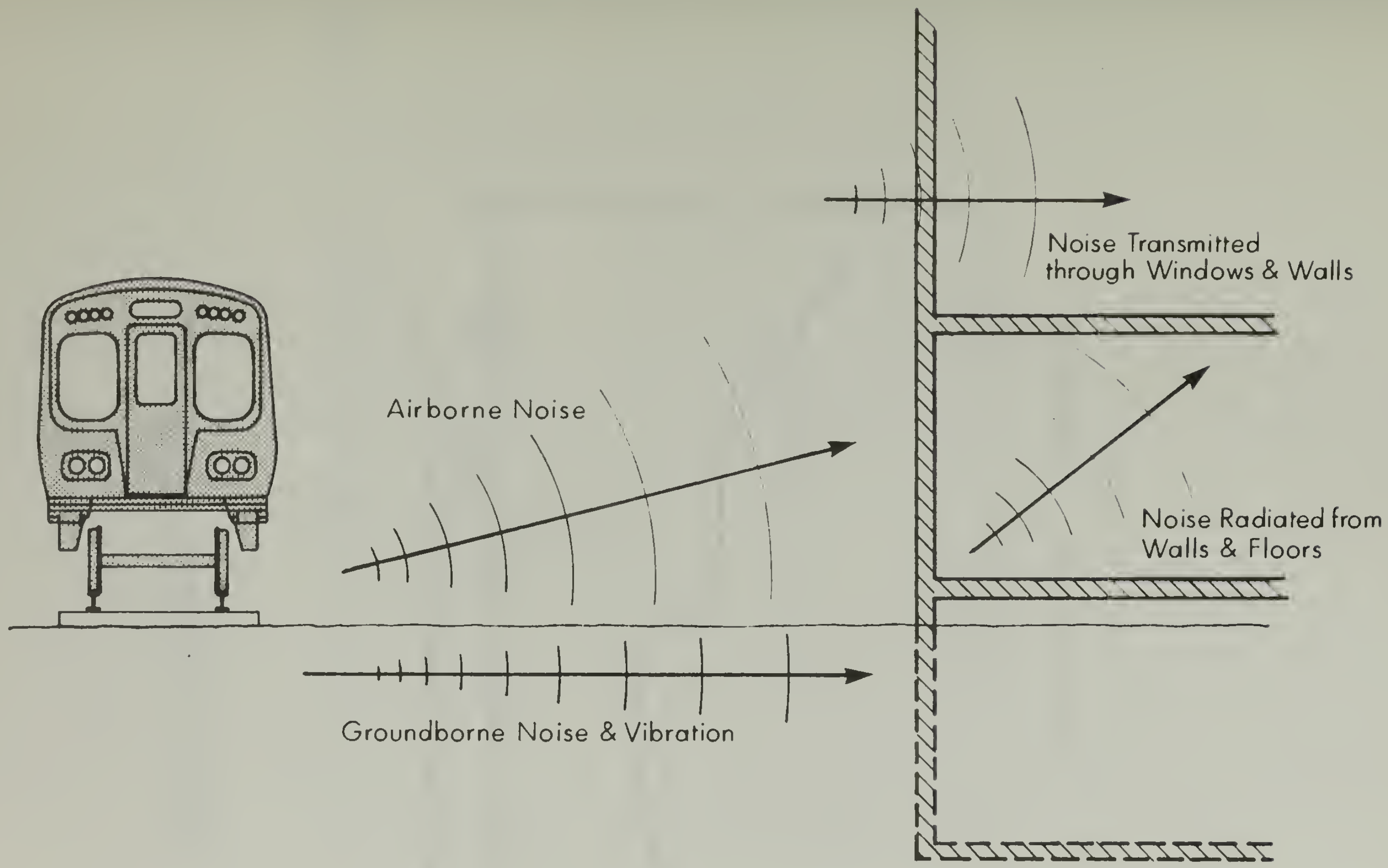
MAJOR NOISE SOURCES:
Trains, Mass Pike Traffic

OTHER NOISE SOURCES:
None

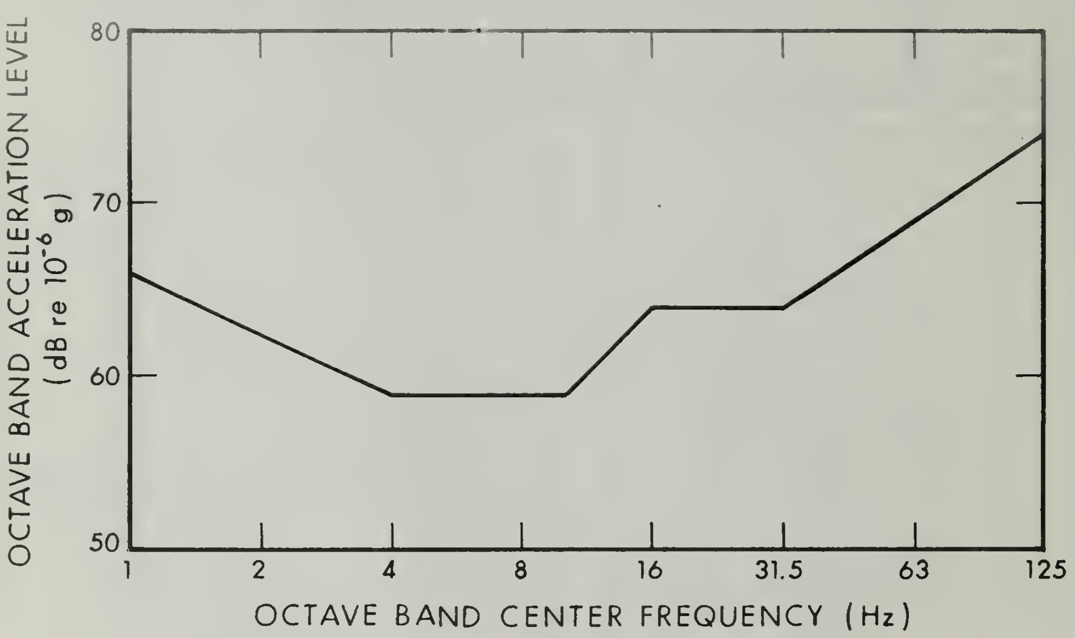
TIME OF MEASUREMENT:
1PM 1/15/76 to
1PM 1/16/76

	DAY	NIGHT	24 hr.
L_{max}	103.7	97.5	103.7
L_{eq}	77.4	71.9	76.1

(FIG. H-12)



(FIG. H-13) SCHEMATIC VIEW OF AIRBORNE AND GROUNDBORNE NOISE AND VIBRATION TRANSMISSION PATHS



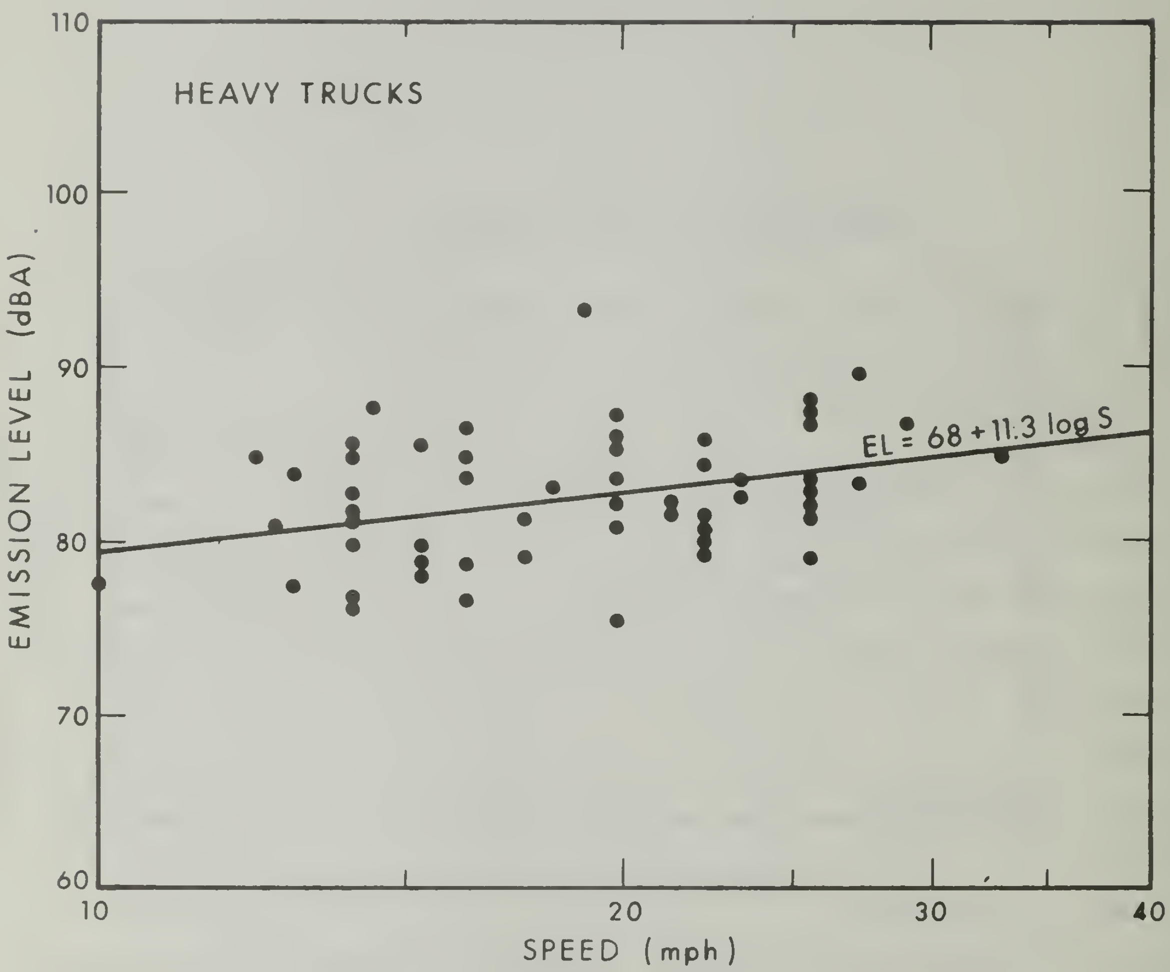
(FIG. H-14) THRESHOLD OF VIBRATION PERCEPTION

(Fig. H - 15)

GROUNDBORNE NOISE LEVEL CRITERIA*

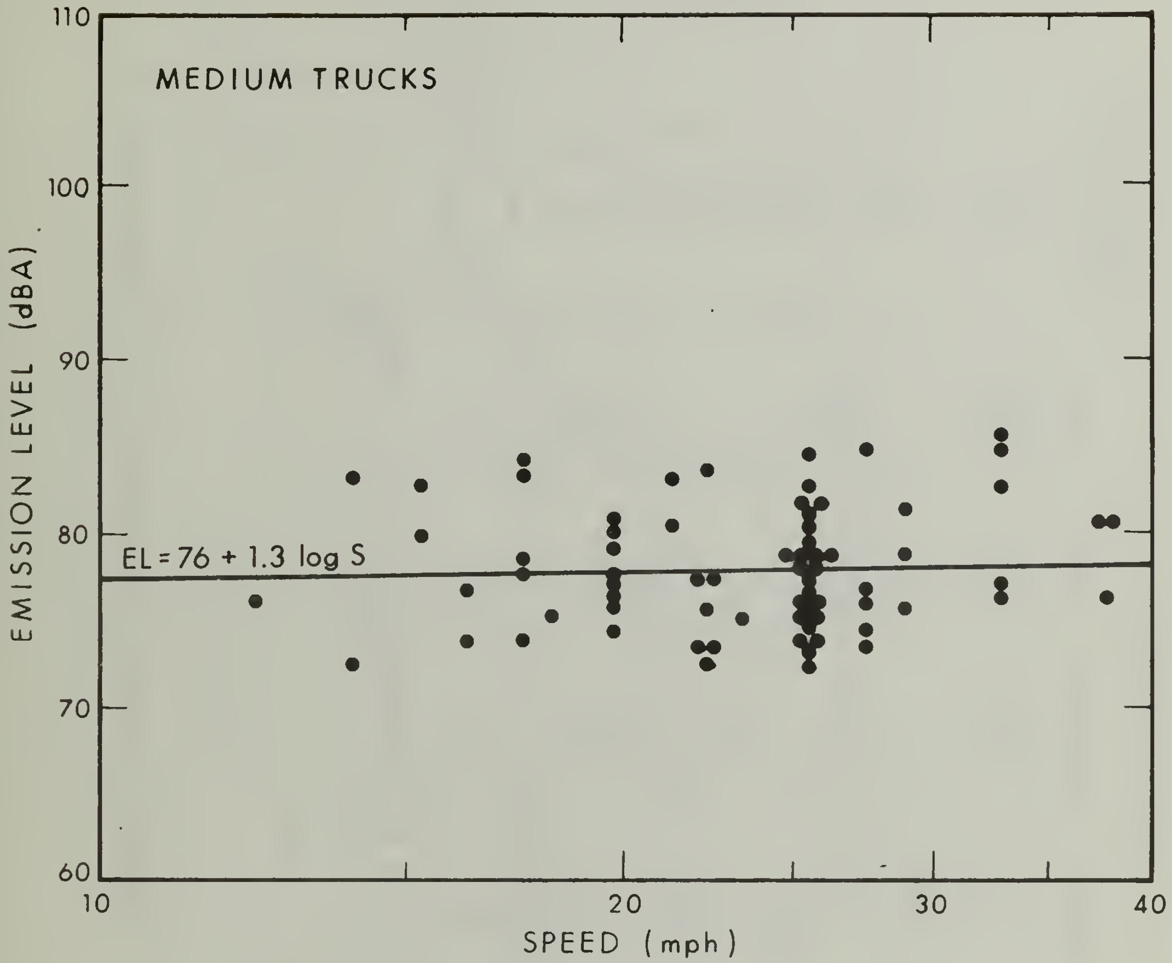
Type of Building or Room	Groundborne Noise Level Criteria
Busy residential	
Private residences	35 to 40dBA
Apartments	40 to 45dBA
Hotels	40 to 45dBA
Auditoriums and Concert Halls	25 to 30dBA
Churches and Theatres	30 to 35dBA
Music Rooms and TV Studios	30 to 35dBA
Hospital Sleeping Rooms	35 to 40dBA
Courtrooms	35 to 40dBA
Schools	35 to 40dBA
University Buildings	35 to 40dBA
Offices	40 to 45dBA
Commercial Buildings	45 to 50dBA

*Adopted from: "Guideline and Principles for Design of Rapid Transit Facilities," Institute for Rapid Transit, May 1973.



SOUND EMISSION LEVEL FOR HEAVY TRUCKS

(FIG. H-16)



SOUND EMISSION LEVEL FOR MEDIUM TRUCKS

(FIG. H-17)

CALCULATION OF CONSTRUCTION NOISE LEVELS FOR SCENARIO NUMBER 1

(FIG. H-18)

Equipment Type [Average Noise Level (dBA) at 50 ft]		Construction Phase: Clearing	Excavation	Foundation	Erection	Finishing	L_{eq}(50 ft) during Work Periods for Each Item Over One Project
Air Compressor	[81]	1.0	1.0	.4	.4	.4(2)*	79
Backhoe	[85]	.04	.4	-	-	.16	74½
Concrete Mixer	[85]	-	-	.16(2)	.4(2)	.16(2)	81
Concrete Pump	[82]	-	-	-	-	-	-
Concrete Vibrator	[76]	-	-	-	-	-	-
Crane, Derrick	[88]	.5	.25	.1	.04	-	80
Crane, Mobile	[83]	-	-	-	.16	-	69½
Dozer	[87]	.3	.4	.2	-	.16	79½
Generator	[78]	1.0	.4	.4	.4	.4	75
Grader	[85]	.08	-	-	.2	.08	74
Jackhammer (P.B.)	[88]	.5	.5	-	.05	.1(2)	80½
Loader	[84]	.3	.4	.2	-	.16	76½
Paver	[89]	-	-	0.1	.5	-	81½
Pile Driver	[101]	-	.25	.1	-	-	89
Pneumatic Tool	[85]	-	-	.04(2)	.1	.04	72½
Pump	[76]	-	1.0(2)	1.0(2)	.4(2)	-	76½
Rock Drill	[98]	-	.02	-	-	-	82½
Roller	[80]	-	-	.01	.5	.5	73½
Saw	[78]	-	-	.04(2)	.04	-	63½
Scraper	[88]	.08	-	.2	.08	.08	78
Shovel	[82]	.04	.4	.04	-	.04	71
Truck	[88]	.16(2)	.16	.4(2)	.2(2)	.16(2)	84½

L_{eq}(50 ft) Per Site During Work Periods (8 hrs.) = 93½

	Clearing	Excavation	Foundation	Erection	Finishing	
Hrs. at Site: Streets, Sewers	12	12	24	24	12	= 84 hrs. = 10½ days
Highways	250	250	500	500	250	= 1750 hrs. = 218½ days

Total Number of Sites: Public Works = 485,224 [60,653 miles (Table III) at 1/8 mi/site]
Highway = 21,178 [21,178 miles (Table III) at 1 mi/site]

CALCULATION OF CONSTRUCTION NOISE LEVELS FOR SCENARIO NUMBER 2

(FIG. H-19)

Equipment Type [Average Noise Level (dBA) at 50 ft]		Construction Phase: Clearing	Excavation	Foundation	Erection	Finishing	L_{eq}(50 ft) during Work Periods for Each Item Over One Project
Air Compressor	[75]	1.0	1.0	.4	.4	.4(2)*	79 - 6 = 73
Backhoe	[75]	.04	.4	-	-	.16	74½- 10 = 64½
Concrete Mixer	[75]	-	-	.16(2)	.4(2)	.16(2)	81 - 10 = 71
Concrete Pump	[75]	-	-	-	-	-	---
Concrete Vibrator	[75]	-	-	-	-	-	---
Crane, Derrick	[75]	.5	.25	.1	.04	-	80 - 13 = 67
Crane, Mobile	[75]	-	-	-	.16	-	69½- 8 = 61½
Dozer	[75]	.3	.4	.2	-	.16	79½- 12 = 67½
Generator	[75]	1.0	.4	.4	.4	.4	75 - 13 = 12
Grader	[75]	.08	-	-	.2	.08	74 - 10 = 64
Jackhammer (P.B.)	[75]	.5	.5	-	.04	.1(2)	80½- 13 = 67½
Loader	[75]	.3	.4	.2	-	.16	76½- 9 = 65½
Paver	[80]	-	-	0.1	.5	-	81½- 9 = 72½
Pile Driver	[90]	-	.25	.1	-	-	89 - 6 = 83
Pneumatic Tool	[80]	-	-	.04(2)	.1	.04	72½- 5 = 67½
Pump	[75]	-	1.0(2)	1.0(2)	.4(2)	-	76½- 1 = 75½
Rock Drill	[80]	-	.02	-	-	-	82½- 18 = 64½
Roller	[75]	-	-	.01	.5	.5	73½- 5 = 68½
Saw	[75]	-	-	.04(2)	.04	-	63½- 3 = 60½
Scraper	[80]	.08	-	.2	.08	.08	78 - 8 = 70
Shovel	[75]	.04	.4	.04	-	.04	71 - 7 = 64
Truck	[75]	.16(2)	.16	.4(2)	.2(2)	.16(2)	84½- 13 = 71½
			L_{eq}(50 ft) Per Site During Work Periods (8 hrs.)				= 85½
Hrs. at Site: Highways		= 250	250	500	500	250	= 1750 hrs. = 218½ days

CALCULATION OF CONSTRUCTION NOISE LEVELS FOR SCENARIO NUMBER 3 (FIG. H-20)

Equipment Type [Average Noise Level (dBA) at 50 ft]		Construction Phase: Clearing	Excavation	Foundation	Erection	Finishing	L_{eq}(50 ft) during Work Periods for Each Item over One Project
Air Compressor	[81]	1.0	1.0	.4	.4	.4(2)*	79
Backhoe	[85]	.04	.4	-	-	.16	74½
Concrete Mixer	[85]	-	-	.16(2)	.4(2)	.16(2)	81
Concrete Pump	[82]	-	-	-	-	-	--
Concrete Vibrator	[76]	-	-	-	-	-	--
Crane, Derrick	[85]	.5	.25	.1	.04	-	77
Crane, Mobile	[83]	-	-	-	.16	-	69½
Dozer	[85]	.3	.4	.2	-	.16	77½
Generator	[78]	1.0	.4	.4	.4	.4	75
Grader	[85]	.08	-	-	.2	.08	74
Jackhammer (P.B.)	[85]	.5	.5	-	.04	.1(2)	77½
Loader	[84]	.3	.4	.2	-	.16	76½
Pave	[85]	-	-	0.1	.5	-	77½
Pile Driver							
Pneumatic Tool	[85]	-	-	.04(2)	.1	.04	72½
Pump	[76]	-	1.0(2)	1.0(2)	.4(2)	-	76½
Rock Drill	[85]	-	.02	-	-	-	69½
Roller	[80]	-	-	.01	.5	.5	73½
Saw	[78]	-	-	.04(2)	.04	-	63½
Scraper	[85]	.08	-	.2	.08	.08	75
Shovel	[82]	.04	.4	.04	-	.04	71
Truck	[88]	.16(2)	.16	.4(2)	.2(2)	.16(2)	84½

L_{eq}(50 ft) Per Site During Work Periods (8 hrs.) = 90dBA

Hrs. at Site:	Clearing	Excavation	Foundation	Erection	Finishing	Total
Streets, Sewers	12	12	24	24	12	= 84 hrs. = 10½ days
Highways	250	250	500	500	250	= 1750 hrs. = 218½ days

Total Number of Sites: Public Works = 485,224 [60,653 miles (Table III) at 1/8 mi/site]
Highways = 21,178 [21,178 miles (Table III) at 1 mi/site]

FIG. H-21

IMMEDIATE ABATEMENT POTENTIAL OF CONSTRUCTION EQUIPMENT 1/

Equipment	Noise Level in dB(A) at 50 ft. Present	With Feasible Noise Control[1]	Important Noise Sources[2]	Usage[3]
Earthmoving				
front loader	79	75	E C F I H	.4
backhoes	85	75	E C F I H	.14
dozers	80	75	E C F I H	.4
tractors	80	75	E C F I W	.4
scrapers	88	80	E C F I W	.4
graders	85	75	E C F I W	.08
truck	91	75	E C F I T	.4
paver	89	80	E D F I	.1
Materials Handling				
concrete mixer	85	75	E C F W T	.4
concrete pump	82	75	E C H	.4
crane	83	75	E C F I T	.16
derrick	88	75	E C F I T	.16
Stationary				
pumps	76	75	E C	1.0
generators	78	75	E C	1.0
compressors	81	75	E C H I	1.0
Impact				
pile drivers	101	95	W P E	.04
jack hammers	88	75	P W E C	.1
rock drills	98	80	W E P	.04
pneumatic tools	86	80	P W E C	.16
Other				
saws	78	75	W	.04
vibrator	76	75	W E C	.4

Notes:

1. Estimated levels obtainable by selecting quieter procedures or machines and implementing noise control features requiring no major redesign or extreme cost.

2. In order of importance:

   T Power Transmission System, Gearing
   C Engine Casing
   E Engine Exhause
   P Pneumatic Exhaust
   F Colling Fan
   W Tool-Work Interaction
   H Hydraulics
   I Engine Intake

3. Percentage of time equipment is operating at noisiest mode in most used phase on site.

1/ Environmental Protection Agency, Construction Noise, 1971

(FIG. H-22)

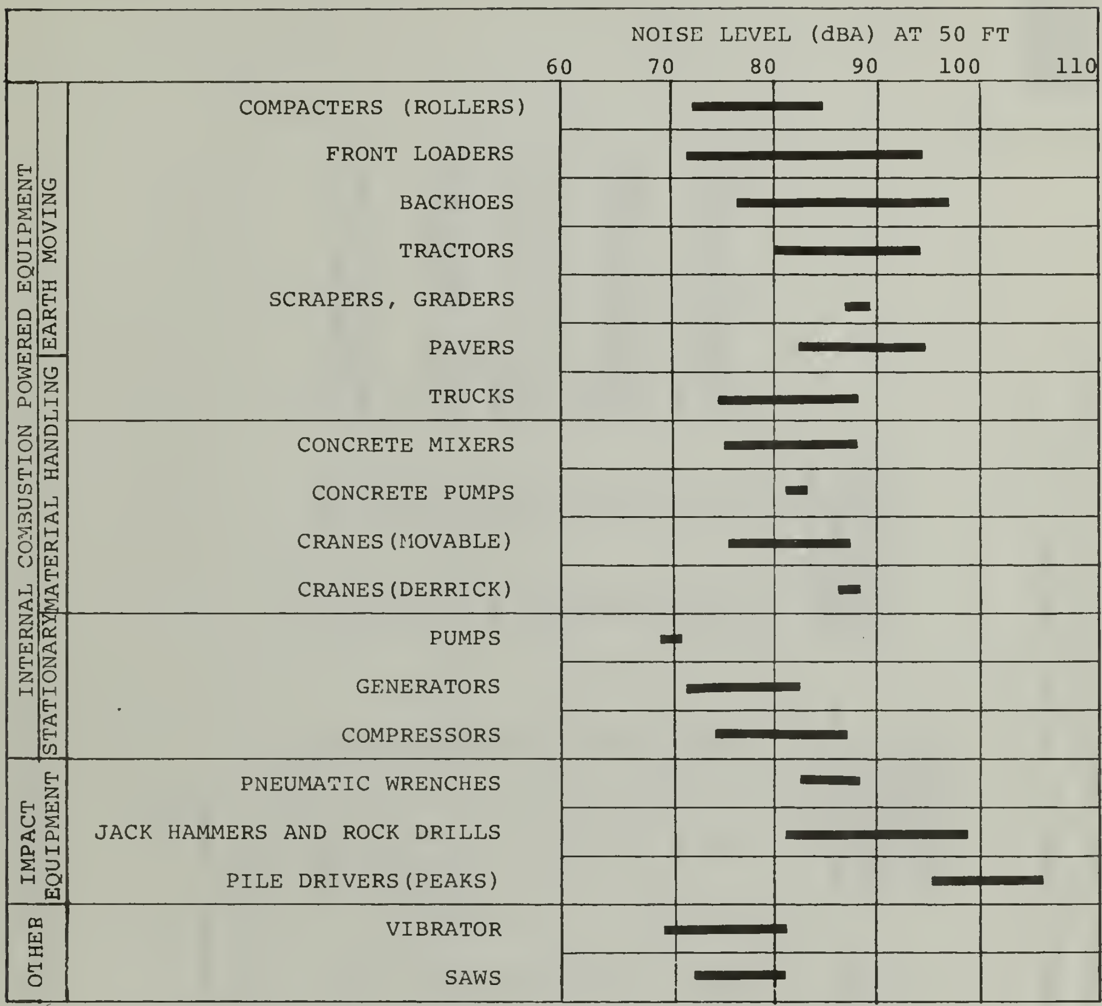
NOISE CONTROL FOR CONSTRUCTION EQUIPMENT 1/

Source	Control Techniques	Probable Noise Reduction in dB(A)*
Engine		
exhaust	improved muffler	10
casing	improved design of block	2
	enclosure	10
fan (cooling)	redesign	5
	silencers, ducts and mufflers	5
intake	silencers	5
Transmission	redesign, new materials	7
	enclosure	7
Hydraulics	redesign, new materials	7
	enclosure	10
Exhaust (Pneumatic)	muffler	5-10
Tool-Work		
interaction	enclosure	7-20
	change in principle	10-30

* Note that noise reductions are not additive. Incremental reductions can be realized only by simultaneous quieting of all sources of equal strength.

1/ Environmental Protection Agency, Construction Noise, 1971

(FIG. H-23)



Note: Based on Limited Available Data Samples

FIG. 1 CONSTRUCTION EQUIPMENT NOISE RANGES 1/

1/ Environmental Protection Agency, Construction Noise, 1971

TYPICAL RANGES OF NOISE LEVELS AT CONSTRUCTION SITES WITH A

50 dBA AMBIENT TYPICAL OF SUBURBAN RESIDENTIAL AREAS 1/

(FIG. H-24)

	Domestic Housing		Office Building, Hotel, Hospital School, Public Works		Industrial Parking Garage, Religious, Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches		
	I	II	I	II	I	II	I	II	
Ground Clearing	83	83	84	84	84	83	84	84	Energy Average dB(A)
	8	15	7	16	9	16	8	8	Standard Deviation
	103	122	101	123	106	124	103	104	NPL
Excavation	88	75	89	79	89	71	88	78	Energy Average dB(A)
	8	14	6	2	6	2	7	3	Standard Deviation
	109	111	105	85	105	77	106	86	NPL
Foundations	81	81	78	78	77	77	88	88	Energy Average dB(A)
	10	17	3	3	4	5	8	8	Standard Deviation
	107	124	84	86	87	90	108	108	NPL
Erection	81	65	87	75	84	72	79	78	Energy Average dB(A)
	10	9	6	2	9	7	9	11	Standard Deviation
	107	87	99	79	107	91	103	108	NPL
Finishing	88	72	89	75	89	74	84	84	Energy Average dB(A)
	7	12	7	8	7	10	7	8	Standard Deviation
	106	104	107	97	105	100	101	104	NPL

I - All pertinent equipment present at site.

II- Minimum required equipment present at site.

1/ Environmental Protection Agency, Construction Noise, 1971

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APPENDIX

Appendix I

PROPERTIES IN THE SOUTHWEST CORRIDOR

OWNED BY THE

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

Appendix I

PROPERTIES IN THE SOUTHWEST CORRIDOR OWNED BY THE MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

Of this list only the properties listed in Appendix K, Section III are affected by the alternatives in this document.

Residential Structures with I-95 Tenants

716 Shawmut Avenue, Roxbury

30 Oakdale Street, Jamaica Plain

3866 Washington Street, Jamaica Plain

Residential Structures with Off-Site Tenants (not tenants at time of taking)

3 Lamar Place, Roxbury

167 Centre Street, Roxbury

Vacant Residential Structures

26 Everett Street, Jamaica Plain

Commercial Structures

E. Cottle Foundation (809-11 Massachusetts Avenue)

Bay State Auto Repair (1 Hunneman Street, 7-14 Spring Street, Roxbury)

Harrison Refrig. (996 Harrison Avenue, Roxbury)

Eustic Recycling (971-975 Harrison Avenue, Roxbury)

H & M Restaurant Equipment (Chas. Wallace in No.'s 2078-80; 2055-65; 2066-74; 2073-79 Washington Street, Roxbury)

Bethel Pentelcostal Church (712-716 Shawmut Avenue, Roxbury)

Electrocom Corp. (1100 Tremont Street, Roxbury)

B & C Shell Gas Station (878-80 Columbus Avenue, Roxbury)

Merit Gas Station (1 & 2 Columbus Avenue, Roxbury)

Donald K. Stuart Auto Service (1211-19 Tremont Street, Roxbury)

Third Nail (1170 Columbus Avenue, Roxbury)

Eliot Motors - rented to City of Boston (partial taking - 1540 Columbus Avenue, Roxbury)

Shell Oil (1533 Columbus Avenue, Roxbury)

Circle Power Demolition (Harrison, Hunneman, Fellows, Webber) (no structure, mobile office unit brought in by tenant)

3 Gas Stations in Forest Hills, Jamaica Plain

ESAC Outpost Green Station

Doherty Lumber Co. (3870 Washington Street, Jamaica Plain)

Donnell Billboards located through out corridor

John Simpson - Auto Repairs (3829 Washington Street, Jamaica Plain)

J
APPENDIX

Appendix J

FOREST HILLS PARKING FACILITY

Appendix J

FOREST HILLS PARKING FACILITY

The information presented in this appendix is a summary of the analysis performed under separate contract to the Massachusetts Department of Public Works. The conclusions drawn from this analysis of the alternatives has been incorporated into the description of Parking Facilities as described in Chapter IV of this Environmental Impact Statement.

PROJECT SUMMARY

A. Project Purpose and Study Process

This study is one of several sponsored by the Massachusetts Department of Public Works (MDPW) to investigate the feasibility of constructing fringe parking facilities for commuter parking. Sites served by the commuter rail or rapid transit systems have been identified for study through a cooperative selection process involving the Massachusetts Bay Transportation Authority (MBTA), the Executive Office of Transportation and Construction (EOTC), the Joint Regional Transportation Committee (JRTC), and MDPW.

The purpose of this report is to present an environmental analysis and program recommendations for a fringe parking project serving the Orange Line at the Forest Hills MBTA Station. The facility, if constructed, would principally serve commuters from the Southwest Corridor communities of Hyde Park, Dedham and West Roxbury. In addition, patrons from the communities of Jamaica Plain, Dorchester, Roslindale, Brookline, Norwood, Westwood, Canton and Needham would comprise most of the remaining park-and-ride traffic at Forest Hills.

The technical study process involved inventory of the area, review of plans and proposals, surveys of other parking sites, demand estimates, alternative investigation and impact analysis. An attempt was made to be comprehensive, within the general locational constraint of the study.

An active attempt was made to involve local citizens and officials through a variety of small and large meetings, workshops, and presentations. Meetings were held to introduce the study, to review the demand, and to review alternatives and impacts with an ad hoc group including the Office of the Southwest Corridor Coordinator, representatives from the surrounding neighborhoods, businessmen, and rail transportation advocate groups. Additional meetings were held with the Joint Regional Transportation Committee (JRTC) parking subcommittee.

B. Recommendations

It is recommended that a 500 car facility in air-rights over the new Forest Hills transit station be incorporated as a part of the Orange Line Relocation Project (see section III of this appendix for details). This alternative is referred to as the "Program 500 Air-Rights Scheme".

A 500 car facility as described in the "Program 500" alternative appears to be appropriate as a base case associated with the Relocation of the Orange Line. Any additional spaces are related to decisions regarding public transportation beyond Forest Hills to Route 128 and Needham. Construction of a 500 car facility on the Air-Rights site as the roof of the proposed transit facility could take plan as part of the Orange Line project with no additional impact upon existing parking spaces during construction and without public acquisition of privately-owned property.

SITE ALTERNATIVES

A. General

Given the proposed changes in the present street configuration as well as decisions regarding final alignment of the Orange Line, a number of preliminary

site options in Forest Hills were identified which might be accessible from new/relocated streets while providing convenient walking distances to a new MBTA station. Of six sites initially considered, four were dismissed at an early stage of the evaluation, due to potential 4(f) parking or adjacency problems plus inconvenient pedestrian relationships to the proposed MBTA station. These locations as illustrated in Fig. J-1 are described below. Site 5 (Fitzgerald) and Site 6 (Air Rights development over the relocated station) were investigated further as the result of this analysis. Schematic design alternatives at these sites were examined in detail and are discussed in Section III of this appendix, Summary of Primary Location Alternatives.

B. Site Location Options

Site 1 - Arborway Site

Site 1, otherwise known as the Arborway Site, lies within the 4+ acre area currently occupied by the MBTA's Arborway garage. The site would not provide convenient pedestrian access to a new station location south of the Arborway and would likely compound existing access and congestion problems on Washington Street. The Authority is considering the continued use of the site as a regional bus parking and maintenance facility which would preclude potential use for commuter parking.

Site 2 - Oil Property Site

Site 2, situated north of the Arborway overpass, comprises a 3.6± acre site on Washington Street opposite Site 1. This location is presently occupied by five large oil tanks and is also used as an equipment storage yard. Potentially affected by the new arterial street option, the site is undesirable in terms of pedestrian access since a location south of the Arborway for the new Forest Hills Station is likely.

Site 3 - Chocorna Street

Site 3, a 2.7± acre parcel off Chocorna Street, a paper street, owned jointly by the MBTA and the City of Boston, is the present site of an unused surface parking facility. This lot previously served Orange Line park-and-ride patrons; it has been closed for several years because of a vandalism problem. If reactivated for fringe parking, the site is remote from a new station and would involve long walking distances.

In addition, the location has adjacency problems with the Asticou Road residences to its immediate west as well as potential automobile access problems. The site would provide only minimal joint development potential in enhancing the environmental quality at Forest Hills.

Site 4 - St. Ann Street

Site 4 lies within the Southwest Corridor right-of-way near the Arborway overpass in a 2± acre site off St. Ann Street. The property is presently under Metropolitan District Commission (MDC) and MDPW ownership.

Potential use of the site is uncertain due to the probable 4(f) conflict with the Arborway and the possible access problem with the ultimate profile of Washington Street. The most recent street configuration being considered at Forest Hills would reduce the available footprint for parking to less than required program minimums.

Site 5 - Fitzgerald Site

Site 5, also referred to as the "Fitzgerald Site", is presently the largest surface commuter lot within the Forest Hills parking inventory; it occupies a 2.7± acre site at the intersection of Washington and Morton Streets and provides

all day parking for approximately 250 cars. Privately-owned, its use as a fringe parking facility would involve public acquisition.

The Fitzgerald Site carries potential for joint development with existing land use since the major portion of the lot is situated behind commercial buildings on Washington Street. The extent to which expansion of parking supply at Fitzgerald involves either the retention or redevelopment of this commercial space within a new facility depends on the ultimate parking demand, staging, and environmental improvement strategy at Forest Hills.

In addition to its joint development potential, and because Site 5 is not directly used by transportation improvements proposed for the Forest Hills area, the Site could be developed on a highly independant implementation schedule. This opportunity is quite attractive, particularly to the extent that a single site can begin to provide a significant parking resource during the construction period for the relocated Orange Line as well as consolidate on-street commuter parking into an off-street facility. This site is the subject of additional analysis.

<u>Site 6 - Forest Hills Station Air Rights</u>

Site 6, the other site retained for further examination, involves the use of the "air rights" within the area created by the realignment of Washington Street and Hyde Park Avenue. The size, configuration and access to this particular location are highly dependent upon roadway and transit profiles and alignments and, although it maximizes joint development potential, it also carries with it an extended implementation schedule, thus reducing its potential to contribute to the immediate upgrading and consolidation of the scattered off-street parking situation at Forest Hills.

SUMMARY OF DEMAND ANALYSIS AND PROGRAM DEFINITION

<u>A. Recommended Parking Program</u>

Future park-and-ride estimates at Forest Hills were developed for the short-term (1980) and the long-range (1995) based on the survey date and Central Transportation Planning Staff (CTPS) patronage estimates for the following three transit service configurations for the Southwest Corridor:

- Base Transit System (Assumes Orange Line Relocation)
- Orange Line Extended to Needham
- Improved Commuter Rail to Needham

A range of parking demand was derived which varied from a low of 300-375 spaces in 1995 (Orange Line Extended) to a high in that year of 1300-1600 spaces (the Base Condition). Improved "super" Commuter Rail Requirements are 975 to 1215 spaces. A tentative program and implementation strategy for the short-range (1980) was defined for $1000^{\pm}$ spaces that would accommodate existing demand levels. The flexibility to either expanded or reduce (by selected closings of existing MBTA/Penn Central lots) spaces in the future depending on the Orange Line decision is a consideration of merit.

Assumptions regarding probable supply options were arrayed against possible demand options for present and projected conditions (1980 and 1995), and judgements were made as to the most reasonable program levels and the extent to which they covered the greatest number of possible supply/demand combinations.

Fig. 5.2 indicates the relationship of demand projections for park-and-ride at Forest Hills for 1980 and 1995 to the following parking supply levels:

- Supply Level 1 ("Program 500") = 500 spaces
- Supply Level 2 ("Program "1,000") = 1000 spaces
- Supply Level 3 ("Program "1,500") = 1500 spaces

The existing parking supply at Forest Hills of approximately 1,000± spaces consists of 350 on-street and 650 off-street spaces. Of these, 900 are used by daily commuters. If a policy which stated that local streets are primarily for local residents were pursued through, say, a parking sticker program (these have been successfully implemented in other Boston neighborhoods), the remaining supply available for commuters would be 650± spaces (or a deficit of 250± spaces based on current usage) in the following 5 surface lots as shown in Fig. J-2. In addition, there are approximately thirty cars* which are parked on vacant land owned by the Department of Public Works between Hyde Park Avenue and Washington Street.

Of the above facilities, only the MDC and Fitzgerald are likely to remain in service over the long haul; the others would be eliminated under present transportation proposals for the area. In addition to these, the now unused Asticou lot with capacity for 150 spaces might be a possible resource during transit/street construction. In summary, the available parking supply for commuters at Forest Hills, at least for the foreseeable future, is a minimum of 200 and a maximum of 450± spaces (with the possibility of 600 if the Asticou lot were reinstituted).

The demand options on the other hand, due to the uncertain future of long-range commuter use of Forest Hills, vary quite dramatically, as shown by Fig. J-3. Daytime parking by local residents and business patrons, which is currently around 100 spaces is anticipated to increase in the future due to higher automobile ownership and commercial activity in Forest Hills. It is impossible to accurately assess future local use, but it might range as high as 300 spaces.

Parking program levels were recommended on the basis of comparing the above supply vs. demand options. Figure J-4 summarizes the results of that comparison.

In summary, the various parking supply options fit within a rational framework that attempts to respond to the great number of long-range uncertainties which seem evident, as well as cover present and interim parking problems and requirements. It is recommended that a new facility be programmed for no more than 500 spaces over the short-term since a Program 500 on either potential location when used in conjunction with existing lots, would meet nearly all anticipated parking demand in 1980 while leaving open future options.

It is assumed that provision of short-term business related parking could be accomplished by means of on-street metered spaces on Washington Street and Hyde Park Avenue. These spaces should be metered for short term use by business use. In the long run any surplus parking resources created by Program 500 in combination with existing facilities under the Extended Transit facility should be applied toward meeting short-term local business and residential needs through the use of meters and a sticker program.

SUMMARY OF PRIMARY LOCATION ALTERNATIVES

The two primary sites investigated herein are the so-called Fitzgerald Site, which is currently a 250± car parking lot, and an "air rights" scheme that would be located over the relocation MBTA Orange Line Station.

These two location alternatives plus a no-build option were developed within the framework of the transit and arterial street options under consideration in the Southwest Corridor; each had several suboptions.

Note:
* Spaces to be lost because of the Orange Line Relocation Project.

Alternative 1 would be developed on the Fitzgerald Site, but would have different access configurations and sizing options.

Alternative 2 developed on air rights over the proposed station location, also carries access and program variations.

Alternative 3 would assume that a new parking facility is not built and that existing parking locations and supply levels would remain.

Alternative 1

This fringe parking location option, proposed for the so-called Fitzgerald Site would be planned to accommodate programs of 500 or 1,000 parking spaces. It is envisioned that the Program 500 would serve as an interim parking resource during Orange Line relocation work which could be implemented immediately (and on a construction schedule independent from other transit/transportation improvements) and thus eliminate nearly all existing on-street parking conflicts. In the long-term, the facility would serve parking demands projected for 1995 under the option to extend the Orange Line to Needham. On the other hand, the Program 1,000 would serve as a long-range solution to parking at Forest Hills in the event that the Orange Line is not extended. Under these circumstances, the 1000-car facility would have to be augmented by other surface parking lots and some on-street supply to meet the anticipated demand of 1500± spaces in 1995. A Program 1500 was also examined, but was dropped from consideration on the Fitzgerald Site due to size, access, and urban design constraints.

Development of either program involves acquisition, either partial or full, of the Mobil Oil and Fitzgerald properties.

Alternative 2

The second location alternative for fringe parking at Forest Hills involves the development of air rights over the relocated Orange Line Station. Programs of 500, 1000 and 1500 spaces were examined in a single parking deck and 2- and 3- level structures, respectively. The Program 500 serves an intermmediate demand of 1000± parking spaces when combined with existing off-street lots such as the Fitzgerald (250 spaces) and the MDC (225 spaces) lots. It also covers long-range projections under the Orange Line extension option. The Programs 1000 and 1500 are designed as additional levels to the Program 500 and are viewed as long-term parking solutions if Forest Hills remains as the terminus of the Orange Line South through 1995.

Construction would be entirely on publicly-owned land and would have to be a part of and coordinated with the transit and railroad construction work.

Programs 500, 1000 and 1500 can all be accommodated above the depressed station alternative on one, two or three decks. Program 500 is the maximum size facility recommended with the rebuilt embankment alternative. This facility is accommodated in two levels adjacent to the station. Program 1000 and -500 are difficult to service and present a very substantial bulk when built with the embankment alternative.

The Program 500 is illustrated in the Forest Hills station layout for both the depressed and embankment alternatives in the body of the report and has a small visual impact on the area.

Alternative 3

This alternative proposes that no action be taken to provide a new fringe parking facility at Forest Hills either to consolidate or expand existing supply levels and examines the implication of such a decision.

Two situations are analyzed: a "do-nothing" alternative which maintains all modes in their present form, and a "1980 Base System" in which the Orange Line is relocated from South Cove to Forest Hills but no new parking facility is constructed.

PRELIMINARY IMPACT EVALUATION

A. General Approach

1. Time Frame

Impacts for the various location and programmatic alternatives are evaluated for the years 1975, 1980 and 1995 corresponding to existing date and available CTPS projections for transit patronage and arterial street traffic volumes. For 1980, the Program 500 options for both locations were evaluated within the context of other anticipated parking supplies to be available within the vicinity of a new station at its opening. In addition, a "no-build" option for opening year was defined as the base case for comparative purposes. (It has been assumed that the 1980 time period corresponds to the implementation of the CTPS "Base System", although the opening year for the relocated Orange Line may actually occur a year or two later.)

For 1995, all program options for the two locations were evaluated since the demand projections supplied indicate the potential for significant reductions or expansions of existing demand/supply levels depending on the ultimate Needham Branch transit technology. Due to such uncertainties in the long range parking picture at Forest Hills, a detailed assessment of the full range of impacts for 1995 was not conducted. In some cases, impacts over the long term, such as local air quality, are not likely to be significantly greater than existing levels in spite of the supply increases suggested by even the largest program options; increases in air pollution levels, for example, are likely to be substantially offset by mandated emission reductions over the long range.

2. No-Build Impacts

It is recognized that the alternative of not constructing a transportation facility at either of the Forest Hills sites may well generate impacts elsewhere in the Southwest Corridor if any of the no-build options outlined under Alternative 3 are pursued. For purposes of this report, two "no-build" options were defined.

Maintenance of Existing Transportation Service Levels

This option is considered a "do-nothing" alternative which maintains all existing transportation facilities (including all modes at Forest Hills) at their 1975 levels of maintenance, operation and level of service, Included as part of this no-build assumption is that the existing parking supply and current usage of 900$\pm$ spaces, described in Section III of this report, remains unchanged. This option provides the absolute baseline for consideration of impacts associated with future modifications to the Forest Hills transportation system.

1980 Base System - "No-Build"

A second no-build option is defined herein which assumes the 1980 Base System configuration proposed by CTPS, i.e., the Orange Line relocated (with no extension beyond Forst Hills) is in operation. For purposes of this feasibility study, it is assumed that total off-street parking supplies are reduced to 500$\pm$ spaces (only the MDC and Fitzgerald lots would remain open) due to elimination of all MBTA-owned and operated lots as a result of proposed transit and street improvements.

Based on this residual off-street supply, the 1980 no-build assumes maximum use of residential/commercial streets for commuter parking purposes, if demand projections are to be met at Forest Hills.

B. Transporation Impacts

Alternatives 1 and 2 (see page J-5)

C. Air Pollution Impacts

1. Summary

Massachusetts does not have an Indirect Source Law which would govern the construction of parking facilities as sources of air pollution. Therefore, the necessity of applying for a permit to construct such a facility in Massachusetts could be required only under federal law. Section 40 CRF 52.22(b) (16) in the 40 FR 128 of July 3, 1975 eliminates parking lots from such permit requirements as of June 26, 1975. Thus, a permit would not be required for a fringe parking facility at Forest Hills.

2. Air Quality Assessment

Consideration of the impact on air quality attributable to the proposed Forest Hills facility was given to both the site (micro) and corridor (meso) scales. In the absence of an extensive ambient air monitoring and computer modelling program, which was outside the scope of this contract, consideration of the impact on air quality attributable to commuter parking in the immediate vicinity of Forest Hills was conducted on a more qualitative basis. Since the area surrounding the site is currently utilized by nearly 1000 park-and-ride patrons, it can be concluded that neither the 500 nor 1000 parking space programs would result in an increase over existing air pollution levels. Even if a 1500 car facility were developed at Forest Hills, it is likely that it would not be in operation prior to the 1995 target year. Decreased automobile emission rates over the long-term (by present legislative mandate) would substantially offset a 500-vehicle rise in the existing parking supply by 1995. Thus, it can be assumed that the "worst case" situation for fringe parking at Forest Hills Station is that which exists today. In any event, the contribution of the Forest Hills Fringe parking facility to the regional burden at the time of parking operation would be markedly less due to general increases in local corridor traffic volumes.

On the other hand, it is possible to discuss in absolute terms a decrease in the general air pollution burden within the Southwest Corridor inside the Route 128 belt under the assumption that improvement of the subject facility would result in increased numbers of vehicles not making the round trip into Boston on a daily basis. Fig. J-5 shows the potential decreases in these major pollutants--Carbon Monoxide, Nitrogen Oxides, Hydrocarbons, and particulates--which might be anticipated under the various design alternatives over and above a "no-build" situation due to reduced vehicle-miles-of-travel in the corridor. These savings although considered to be of minimal impact do make a contribution toward improved regional air quality.

D. Noise Impacts

1. Summary

To assess the potential increase in local noise levels that result from the construction and operation of the parking facility, measurements of existing noise levels were taken at the site at those locations where the new facility would exert the greatest noise impact. These measurements were used in conjunction with projected traffic estimates to predict future noise levels.

2. Applicable Noise Standards

The consideration of noise as an environmental pollutant is somewhat unusual. It is not the source of the noise but rather its receptor that is of significance. This perspective is recognized in the Federal Highway Administration design standards for noise in which they recognize various categories of receptors and identify appropriate upper limits for the noise levels to which these receptors should be subjected. Fig. J-6 presents those limits and the types of land use, i.e., receptors, to which they are applicable.

The sound levels are expressed in decibels measured on the A scale, dBA, which is the most realistic scale of measurement for the assessment of human sound reception.

There are commonly three "categories" of noise which are considered for both monitoring of existing conditions and predictions of future noise levels. They are the L_{10}, L_{50} and L_{90} levels and they refer to the noise level which is exceeded 10%, 50 and 90% of the time, respectively.

3. Projected Noise Impacts

Fig. J-7 gives the predicted noise levels at each of the monitoring stations for 1975, 1980, and 1995 (with and without the Orange Line extension). The increase reflected for these target years over and above existing levels are attributable to anticipated traffic volumes. The increase due specifically to a fringe parking facility represents only a small percentage of this difference. For example, in the extreme case, Site 4, the maximum differential is an increase of 6 dBA in 1995 over existing readings. Since average daily traffic (ADT) on relocated Washington Street is projected to increase significantly over the existing daily totals on St. Ann Street, the major share of the 6 dBA rise is clearly related to the introduction of new street traffic.

E. Ecological Impacts

The Forest Hills site lies within an area which is highly disturbed through the process of urbanization. The physical features of the natural environment (water, geology, and vegetation) have already been massively altered; and it is believed that the proposed fringe parking facility at either the Fitzgerald Site or the air-rights location will not add a significant new increment to the area's present condition.

A preliminary site analysis including hydrogeology and vegetation/wildlife within the vicinity of Forest Hills was conducted to determine the potential effects that fringe parking might have on the ecology of the area.

The following conclusions can be drawn from this preliminary analysis:

- About three-quarters of the land area in the vicinity of the site is in residential use; the other quarter contains part of the Arnold Arboretum and a few scattered patches of urban open space.

- The vegetation that occurs on the site consists of two types: ornamental trees and shrubs along the streets, in open space that is preserved and maintained for public enjoyment, and in private yards; and scattered patches of undeveloped land dominated by trees and shrubs endemic to the area.

- The wildlife on the site are both species which have long been associated with urban areas, and species that occur on the fringes of urban areas and which, given a small amount of open space, can survive in cities.

- The patches of undeveloped land, maintained open space, and roadside trees and shrubs are valuable because of the multitude of ways in which they stabilize the urban ecosystem. For example, open space provides a source area for groundwater recharge, purifies air, and provides richness and complexity of habitat that can support a diversified fauna.

- No rare or endangered species of plants or animals were observed on the site.

- The planned fringe parking facility will cause no adverse impacts to the ecology of the site provided: that the facility is located on that portion of the site that is already highly urbanized; that the woodlands, open space, and roadside vegetation not be disturbed; and that, if a location is selected that will border the Arnold Arboretum, investigations be carried to the next level of detail to determine possible effects of the facility on the vegetation in the Arboretum.

Since the proposed location of a parking facility does not violate the above provisos, no adverse ecological impacts are anticipated.

F. Historic and 4(f) Impacts

The proposed Forest Hills parking sites do not include any historic districts or properties. At present, none of the location alternatives affects lands which have been classified as Section 4(f) properties. The Olmstead network is a historic property on the National Register but is not affected by the location of parking.

G. Economic Impacts

1. Property Takings

Of the two sites given consideration as potential locations for a fringe parking facility at Forest Hills, only the Fitzgerald Site would involve property takings.

Depending on the program undertaken on the Fitzgerald Site, a partial or full taking might be required. In addition, the Mobil Oil property would be required. For Program 500, it is likely that only a partial acquisition would be necessary since the scheme occupies only half of the site. It is not likely, however, that the residual surface parking lot operated by Fitz-Inn Parking, Inc. could remain in operation during the construction of a new facility; since existing unused lots are available in the vicinity of Forest Hills, an interim

relocation scheme might involve Fitz-Inn operation of the Asticou lot on a temporary basis. At completion of the fringe parking facility, a leaseback arrangement for its operation and maintenance might be negotiated. Under a partial taking, the residual Fitzgerald parking site could be operative assuming that suitable access as well as the number of spaces retained by the owner is a financially-viable one.

Program 1000 for the Fitzgerald site would require additional takings in order to minimize the structures profile and bulk. In short, the construction of this facility option would require taking at least some of the existing commercial properties along Washington Street. Although new commercial space could be provided at the street level of a parking structure as replacement space, an inadequate amount of existing vacant space for interim location purposes render this approach, for the short-term at least, impractical. This approach, from a local business perspective, also runs counter to prevailing objectives for short-term maintenance and improvement of the existing business establishments.

The scope of this contract does not provide for an in-depth market and financial analysis of the existing commercial structure or its future potential. Since the Program 1000 is viewed as a long-range parking solution, and since the long-term economic impacts are difficult if not impossible to predict, an economic evaluation of this option was not conducted.

Property taxes are the primary source of municipal revenue and local officials often express concern about actions which significantly reduce the city's tax base. Public acquisition is one of the major means of removing property from the tax rolls and consequently has impacts on the municipal revenue picture.

Assuming that the Program 500 on the Fitzgerald site is implemented, the estimated first year tax impact would be $12,500. This figure is derived utilizing the fiscal year 1976 tax rate of $196.70 per thousand dollars of assessed valuation. If a full taking of the Fitzgerald site were exercised, including the Mobile Oil property, the result would be an estimated first year tax loss to the City of $21,500. While it is difficult to project long-term tax impacts, it can be stated that these tax impacts of this taking alone will not be significant in relation to the total tax levy for the City of Boston. No negative tax impacts are attributable to the air-rights alternatives, since no private property is required.

H. Construction Estimates

Quantities for cost estimating purposes were developed from the above alternatives including contingencies and design fees. Construction cost estimates for the following major cost components for each alternative were prepared.

- Site preparation: grading, embankment, excavation and demolition of existing buildings, structures or retaining walls.
- Surface improvements: roadway, parking lot, guard rail, curbing, drainage, retaining wall, wheel stops and painting.
- Lighting: access roadway and parking facility.
- Control System: ticket dispenser, collection booth and equipment.
- Signing: sign boards and support structures.
- Landscaping: grading, seeding and planting, as required.
- Off-site improvements: traffic signal and detector, right-turn lane paving and lane markings, as required for efficient parking operation.

I. Summary Evaluation

Fig. J-8, Summary Evaluation Chart presents the location/program alternatives.

1. Program 500/Transit Depressed

An alternative Program 500, illustrated by Figure J-2, to be configurated within air-rights over a new Forest Hills Station could be developed in conjunction with a below-grade or semi-depressed transit profile for the Orange Line relocation project. The preliminary design for Program 500/transit depressed provides for 500 park-and-ride spaces on a single deck to be structured over the relocated Green Line (Arborway) and has loading/staging areas. 25 kiss-and-ride spaces are included in the scheme and one located near the station lobby entrance level for convenient drop-off and pick-up access.

The increment to existing commuter parking supply provided by Program 500 therefore total 525 spaces. The principal automobile access/egress is provided by an elevated jug-handle located at the intersection of Washington Street and the southerly connecting street. This configuration would ramp up from an at-grade connection with the intersection to provide adequate clearance over the Penn Central Needham Branch (or, conversely, the Orange Line extension), then loop back and over Washington Street into the parking deck. The access facility would be designed to provide three moving lanes; it is envisioned that the center lane would be reversible to allow two (2) entering lanes during the morning peak and two (2) existing lanes during the evening peak hour. All movements into and out of the parking facility would be controlled by signalization to be provided at the intersection under the arterial street improvement program.

Entrance and exist points to the kiss-and-ride area, which is located under the parking deck adjacent to the Arborway (Green Line) staging area, would occur off Washington Street. The design of this area involves a one-way flow-through parking system with angled stalls for approximately 25 cars.

Efficient collection of parkers is achieved by orienting parking aisles perpendicular to the stair towers in order to faciliate ease of pedestrian access and to minimize walking distances. For convenient pedestrian movement from car to station lobby, two escalator/stair elements are located within the center of the parking area. These penetrate the deck along the median between the Green Line and bus staging areas where a covered sidewalk orients patrons directly toward the MBTA Station Lobby.

The Program 500/Transit Depressed is viewed as a short-term action which also relates to a long-term parking strategy for Forest Hills whether the Orange Line is extended to Needham or not. In the short-term, this solution is similar to the Program 500 Transit Elevated described above; i.e. 500 spaces on air air-rights, in conjunction with surface lots at Fitz-Inn and the MDC, provide just under 1000± off-street spaces which is sufficient to accommodate a modest expansion in existing demand levels anticipated between now and the first year of operation. This total new supply figure assumes that other MBTA-operated lots totalling approximately 200± spaces are no longer in operation at completion of the Orange Line relocation work (these include the Car Barn, Penn Central, and Washington/Morton Street lots) and that the residential streets presently impacted by commuter parking are no longer required as a key resource. On-street parking associated with Washington Street and Hyde Park Avenue could also be converted to a short-term parking supply serving adjacent commercial uses through the installation of parking meters.

In the long-term, Program 500 is adequate to supply all parking demand at Forest Hills provided parking is developed at Route 128 and other locations as part of an Orange Line extension project. This would permit the decomissioning of the MDC lot under the Arborway (for potential) re-establishment of the link between the Arboretum and Franklin Park). The scheme also retains the

opportunity for redevelopment of the Fitzgerald site for more intensive land uses, thus fully consolidating all off-street commuter parking into a single facility.

Over the long-range, however, this Program 500 is capable of not only covering the low target assumptions of an Orange Line extension alternative, but with additional levels could be expanded to meet the high projections assuming no extension is built. One potential means of expansion is to provide additional levels on the facility. The discussion of Programs 1000 and 1500 which follows describe this expansion.

2. Program 1000

The Program 1000 and Program 1500 are viewed as an expansion of the Program 500, described above, through additional parking levels. The preliminary design provides for 1000 park-and-ride spaces with 30 kiss-and-ride spaces to be developed at ground floor level near the lobby of the relocated Forest Hills Station for a total parking supply of 1030 of 1530 spaces.

Any decision to build more than a Program 500 facility would be made with decisions on Forest Hills/Needham Transportation improvements.

Impacts of the combined parking supply can be established by referring to FIG. J-8.

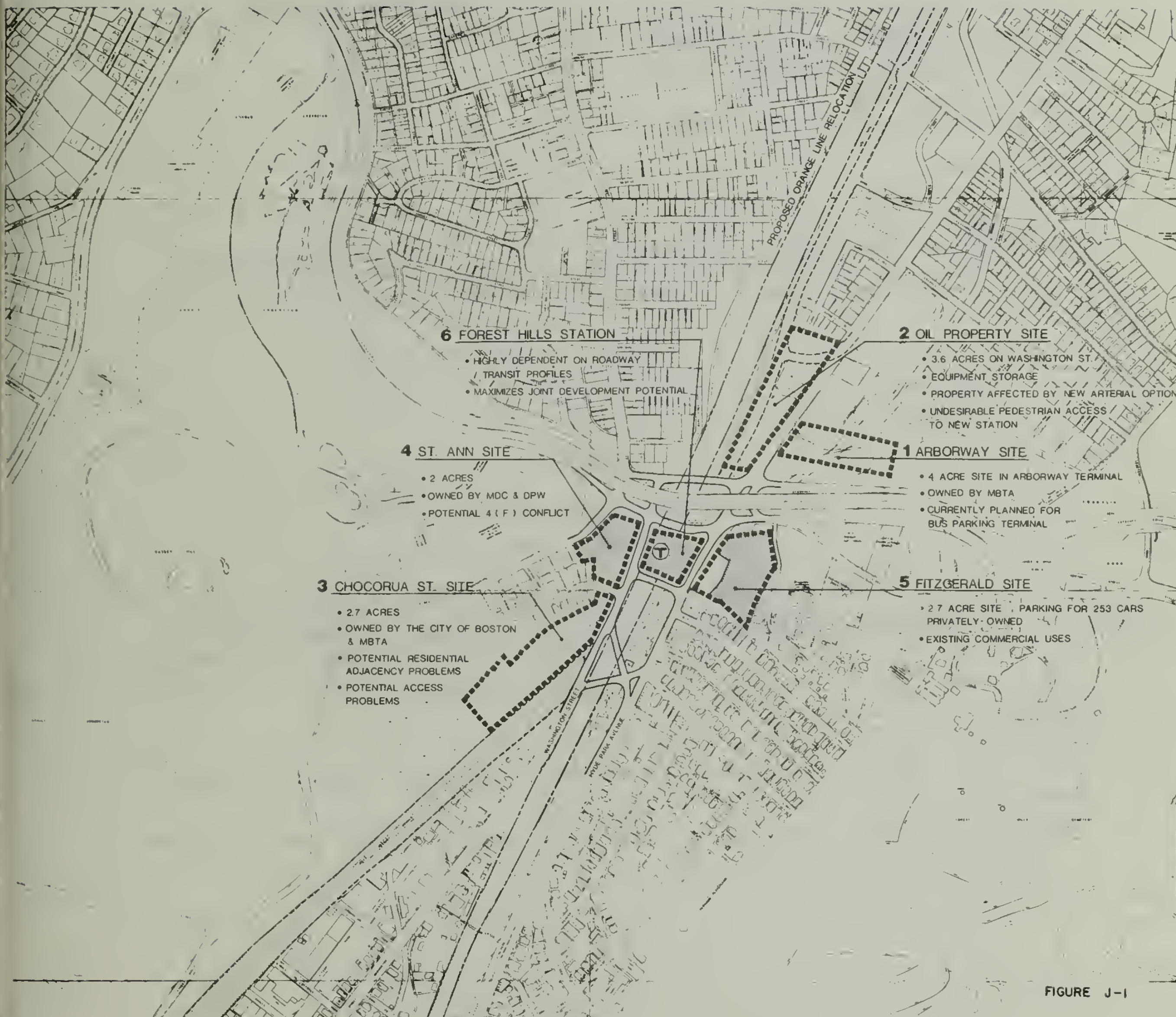
PROPOSED ORANGE LINE RELOCATION
6 FOREST HILLS STATION
• HIGHLY DEPENDENT ON ROADWAY / TRANSIT PROFILES
• MAXIMIZES JOINT DEVELOPMENT POTENTIAL
2 OIL PROPERTY SITE
• 3.6 ACRES ON WASHINGTON ST.
• EQUIPMENT STORAGE
• PROPERTY AFFECTED BY NEW ARTERIAL OPTION
• UNDESIRABLE PEDESTRIAN ACCESS TO NEW STATION
4 ST. ANN SITE
• 2 ACRES
• OWNED BY MDC & DPW
• POTENTIAL 4 (F) CONFLICT
1 ARBORWAY SITE
• 4 ACRE SITE IN ARBORWAY TERMINAL
• OWNED BY MBTA
• CURRENTLY PLANNED FOR BUS PARKING TERMINAL
3 CHOCORUA ST. SITE
• 2.7 ACRES
• OWNED BY THE CITY OF BOSTON & MBTA
• POTENTIAL RESIDENTIAL ADJACENCY PROBLEMS
• POTENTIAL ACCESS PROBLEMS
5 FITZGERALD SITE
• 2.7 ACRE SITE . PARKING FOR 253 CARS PRIVATELY-OWNED
• EXISTING COMMERCIAL USES
WASHINGTON STREET

FIGURE J-1

(FIG. J-2)

AVAILABLE OFF-STREET PARKING SUPPLY AT FOREST HILLS

(within 1,000 feet of station)

Lot	No. Space Available
Walk Hill under car barn (MBTA)	120*
Penn Central off St. Ann Street (MBTA)	45*
Washington/Morton (MBTA)	35*
MDC (Arborway)	225**
Fitzgerald (privately owned)	250
TOTAL	650

NOTES:
* Spaces to be lost because of the Orange Line Relocation Project.
** These spaces could be phased out as part of a restoration of the Olmsted Green connection between Arnold Arboretum and Franklin Park.

(FIG. J-4)

PARKING PROGRAM LEVELS AT FOREST HILLS

(1980 & 1995)

	Demand Options		Supply Options			
	Commuter	Community	Eliminate MDC & Fitz	Leave Fitz	Leave MDC	Leave MDC & Fitz
1995 Extended Orange Line	400	100-300	500-700	250-450	300-500	50-250
1980 Base	1200	100-300	1100-1300	850-1050	900-1100	650-850
1995 NO	1600	100-300	1700-1900	1450-1650	1500-1700	1250-1450

(FIG. J-5)

ANNUAL POLLUTION DECREASES IN THE SOUTHWEST CORRIDOR ATTRIBUTABLE TO COMMUTER PARKING AT FOREST HILLS (UNITS = TONS)

Pollutant Category	Year/Total Parking Supply			
	1975	1980	1995	
	900 spaces	1000 spaces*	500 spaces	1500 spaces
Carbon Monizide (CO_2)	71	49	72	49
Nitogen Oxide (NO_X)	16	15	25	17
Hydro Carbon	6	7	13	9
Particulates	2	2	6	4

* It is assumed that in 1980 that 1000 commuter spaces might be comprised of Program 500 plus the MDC and Fitzgerald Lots. Residential and business-related parking is not included in this total.

(FIG. J-6)

NOISE LEVELS/LAND USE RELATIONSHIP
(FHWA)

Land Use Category	Design Noise Level - L10	Description of Land Use Category
A	60 dBA (Exterior)	Tracts of lands in which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate land officials for activities requiring special qualities of serenity and quiet.
B	70 dBA (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.
C	75 dBA	Developed lands, properties or activities not included in categories A and B above.
D	--	For requirements on undeveloped lands see paragraphs 5.a(5) and (6) of PPM 90-2.
E	55 dBA (Interior)	Residences, motels, hotels, public meeting rooms schools, churches, libraries, hospitals and auditoriums.

(FIG. J-7)

PEAK HOUR TRAFFIC NOISE LEVELS
L10 dBA @ RECEPTOR

Station Receptor	1975	1980	with Transit Extension 1995	with Transit Extension 1995
1	58	59	60	60
2	65	69	71	71
3	76	77	78	78
4	66	71	70	72

(FIG. J-8)

SUMMARY EVALUATION CHART

Impact Category	Location Alternative 1 Fitzgerald Site Program 500	Location Alternative 1 Fitzgerald Site Program 1000	Location Alternative 2 - Air-Rights Site Program 500 (Elevated)	Location Alternative 2 - Air-Rights Site Program 500 (Depressed)	Location Alternative 2 - Air-Rights Site Program 1000	Location Alternative 2 - Air-Rights Site Program 1500	Alternative 3 No-Build
Project Development Cost							
Average Parking Cost/Space							
Maintenance Cost Operating Cost	16,500 29,000	33,000 58,000	16,500 29,000	16,500 29,000	33,000 58,000	49,000 87,000	N/A N/A
Probable Design and Construction Time							
Off-Street PR&KR Parking Capacity (including existing lots)	525 (900±)	1,030 (1250±)	525 (1000±)	525 (1000±)	1,030 (1250±)	1,550	500±
Access to Site	Good	Good	Poor	Good	Good	Fair	Poor
Internal Site Circulation	Good	Good	Fair	Good	Good	Fair	Poor
Air Pollution Impacts (Federal Carbon Monoxide Standards)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Noise Impacts	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Ecological	Minor	Minor	Minor	Minor	Minor	Minor	Minor
Historic or 4(f) Impacts	None	None	None	None	None	None	None
Property Takings and Relocation	1 Business (Parking lot)	Substantial (see Sect.IV.G.1)	None	None	None	None	None
Estimated First Year Tax Impacts	12,500 21,500	Substantial (see Sect.IV.G.1)	None	None	None	None	None

k

APPENDIX

Appendix K

RELOCATION AND LAND REQUIREMENTS

I. DESCRIPTION OF HOUSEHOLDS AND BUSINESSES AFFECTED, AND PRELIMINARY INVENTORY OF RELOCATION NEEDS.

A. General Description of Household Characteristics

The following description of households affected by the takings is based mainly on the City of Boston's List of Persons as of January 1, 1975. The information should be regarded as merely indicative of the types of households that will be affected in the South End, since this is a very transient area and most of these persons will probably have moved by the time the project is implemented. The List of Persons does not include persons under 19 years of age, but observation of the area and census data suggest that there are few children in the affected housing. The Jamaica Plain properties have a more stable population, and some of these households may still be living there when the project is implemented.

Fig. K-1 summarizes the information derived from this source. In the South End there are approximately 44 persons affected, most of them one-person households. Almost half of the persons are under 30; about half are in white-collar occupations and an additional quarter are students. These properties house a highly transient population. Of the 44 persons listed in 1975, only 12 were listed in 1973 and 5 in 1970.

In Jamaica Plain 46 adults will be affected, living in 24 households. Most are above 30 years of age, and about one-third are over 60. Their occupations are varied, but fully one-half are retired or at home. These households are more stable: of the 46 persons listed, 33 were living there in 1973 and 23 in 1970.

A comparison with census data for 1970 confirms some of these findings (see Fig. K-2). For the blocks in the South End containing the affected properties, the households are small, the percentage of young persons low, the percentage of elderly persons lower than the city average in one block, higher in the other. The percent of minority households is low. Rental units predominate, the average rent in 1970 was lower than the city as a whole in one block, higher in the other, and the apartments are small.

In the Jamaica Plain blocks where the affected properties are located, the average household size is higher than the city's, for the most part; the percent of young persons is higher than the city; and that of elderly persons generally lower than the city. Renters predominate, rent is lower than the city's average, apartments are larger than in the city generally.

The major problems of relocation in the South End will be to find new apartments at comparable rents for the few elderly and retired persons (and the one person who describes himself as "disabled") living in the affected properties. Most of the other occupants have lived in their apartments for two years or less and probably regard their stay as temporary.

In Jamaica Plain the households in the affected properties are varied in their characteristics, and a considerable number have elderly family members. Their relocation will raise the problem of finding other houses or apartments at comparable costs.

Fig. K-3 shows the estimated number of households to be relocated, based on the 1975 occupancy of the affected properties.

B. General Description of Business Characteristics

Some or all of the following 21 businesses will be affected by full takings of their properties, depending on the alternative chosen:

John Stuart, Inc.
Mac-Ellis Tires
Garnet Lounge
Northeastern University parking area (Ruggles & Columbus)
Davis Monumental Works, Inc.
AAA Auto Parts
J & M Brown Co., Inc.
Fran & Pat's Sub Shop
Arsenault Saw Service
Arkin Furniture Co.
Junkyard (adjacent to 352 Amory St.)
Bill's Auto Service
Garage for Two Cars (95 Mozart St.)
La Casa Alegre
Able TV
Stony Brook Tavern, Inc.
Athena Market
Discount Tire Mart
Cardarelli & Son
Parker Hill - Fenway Neighborhood Employment Center
Corner Tavern, Inc.

One veteran's organization will be affected by full taking of its property:

American Legion Post #76

Fourteen business properties will be subject to partial takings which will have little impact on their business operations:

Northeastern University parking areas (Ruggles & Forsyth, and adjacent to 6 Gainsborough Street)
Fruit Stand
Kehian Real Estate
Morgan Memorial
Liberty Service Station
Boston Arena
American Cellophane & Plastic Films Corp.
Hanson Contracting Co.
Colourpicture Publishers, Inc.
Kilgarriff's Cafe, Inc.
Kinney Vacuum
Jenney Oil Co.
Cappy's Towing and Wrecking

Details of these businesses and the impact of relocation are given on Fig. K-4.

C. Community Participation

Plans for the relocation of the Orange Line have been discussed at public meetings on various occasions.

At these meetings, the proposed takings described above were announced. Apart from these occasions, the households and businesses affected have not been approached directly.

II. RELOCATION PROCEDURES

Relocations will be undertaken in accordance with the Authority's established procedures, which conform with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

Aside from the acquisition of railroad rights-of-way (undertaken under a separate project) terminal properties and station properties, acquisition of land from other private parties will be minor, if any.

In the case of land acquisitions, the Authority will be guided by the requirements of Title III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 which includes the following policies:

-- Every reasonable effort shall be made to acquire real property by negotiations.

-- Before negotiation is initiated, real property much be appraised, and the owner or his/her agent must have the opportunity to accompany the appraiser during inspection of the property.

-- Before initiation of negotiation, an amount believed to be just compensation shall be determined on the basis of the approved appraisal of fair market value of the property to be acquired. An offer to acquire the property for the amount so determined shall be promptly made.

-- Before an owner is required to surrender possession of real property, he/she shall be paid the full amount of the agreed purchase price or the amount of an award in condemnation proceedings, or an amount not less than the approved market value of the property shall be deposited with the court in condemnation proceedings.

-- If an interest in real property is to be acquired through eminent domain, proceedings should be begun promptly to avoid the necessity for an owner to undertake legal action to establish the fact of a taking of his/her real property.

-- If acquisition of part of the property would leave the owner with an uneconomic remnant, the applicant shall offer to acquire the remnant.

-- In acquiring real property, the applicant shall avoid scheduling construction that will require a lawful occupant to move from a dwelling or to move a business or farm, without ninety (90) days written notice of the required moving date. If the property is rented to the former owner or to a tenant for a short term or one subject to short notice, no more than the fair rental value for a short-term occupancy shall be charged.

-- In acquiring real property, the applicant shall not advance the term of condemnation, defer negotiations, condemnation or the deposit of funds in court, or take any other coercion action to compel an owner to agree to a price for his property.

When the Authority makes an offer to purchase real property, it will provide the property owner with a written statement of the basis for the amount determined to be just compensation. The statement shall include:

-- An identification of the real property and the particular interest being acquired.

-- If any separately held interest in the real property is not being acquired in whole or part, a certification to that effect.

-- An identification of buildings, structures, and other improvements, including fixtures, removable building equipment, and any trade fixtures considered to be part of the real property.

-- Identification of any real property improvements, including fixtures, not owned by the owner of the land.

-- Identification of the types and approximate quantity of any personal property located on the premises that is not being acquired.

-- A declaration that the determination of just compensation is based on the fair market value of the property; is not less than the approved appraised value; disregards any decrease or increase in fair market value attributed to the project for which the property is being acquired; and apportions the total amount of the compensation among separately held interests in the property.

-- The amount of any damages to any part of the real property excluded from the taking.

Other requirements relating to payments to tenants for any improvements made to real property that is to be taken, and reimbursement for expenses incidental to the transfer of title to the real property acquired and to litigation expenses, are included in the DOT regulation 36 F.R. 9178 at 9189.

A. Relocation of Residents

Owners Six of the units are owner occupied. Since this is a small number, there should be no problem in finding replacement housing in the same vicinity as a result of normal turnover in the housing market. As the cost of housing continues to increase in the South End, the relocating owners will probably have to make use of the payment in addition to the fair market value in order to buy a comparable dwelling in the same vicinity.

Renters - Elderly and Disabled This group of residents will have the greatest difficulty in finding and starting over in another apartment. As the number is small--an estimate of 8 such households--it should be possible to find suitable apartments in the same vicinity given a turnover in the apartment market.

A recent study of housing in the South End*, however, points to the difficulty of relocating persons in the South End generally, and of placing low-income residents in subsidized housing.

> Testimony at hearings stated that of 2,347 persons displaced since 1966, over 1,500 expressed preference to remain in the South End, and that approximately 80 percent of the 1,500 were eligible by income for low-income housing. Among the elderly within the 1,500, 85 percent wanted to stay in the South End, and 66 percent of the families wanted to remain.
>
> The BRA relocated 918 households in the South End, 582 short of the 1,500. It relocated 998 households in low-income units--584 within the South End-- of 1,900 households who qualified for low-income housing: 902 less than those who qualified.

Renters - Non-Elderly Transient residents in the South End will have no difficulty in finding other small apartments in the South End, Back Bay, or Beacon Hill areas, all similarly located in relation to the city center, jobs, and transportation.

*South End Project Area Committee (SEPAC), Review of Report on Housing in the South End prepared by the Boston Redevelopment Authority, (Draft), 1974, p. 1-45.

In Jamaica Plain, the non-elderly renters have lived in their apartments for several years and may experience difficulty in finding apartments at comparable rents.

Moving of Houses Although moving and raising of houses (see Table 1) are considered as full takings in this report, it is likely that occupants can be relocated back into the original structure.

B. Relocation of Businesses

Each of the relocating businesses will have to find premises to suit their needs. Some specific problems will be the transfer of liquor licenses of the Garnet Lounge, Corner Tavern, Stony Brook Tavern, and American Legion Post #76; and the open storage yards of AAA Auto Parts and Cappy's Towing and Wrecking. Most of the businesses would not be suitable for new development, as the rental or costs would be too high. Three possible exceptions are Davis Monumental Works, J & M Brown Co., Inc., and the American Legion Post. Several of the businesses are only to be taken if the Arterial Street is to be built in Jamaica Plain.

Some properties affected by partial taking would have to rearrange their internal site circulation. These changes will have to be made after detailed study of each site.

III. RELOCATION FROM STATE-OWNED PROPERTY

In addition to the properties listed in the main part of this report, there are a number of state-owned properties which the Project will affect. These properties were acquired by the state several years ago for the construction of Route I-95. The state Department of Public Works has an unfulfilled responsibility to relocate the 2 households and 7 businesses still occupying these properties.

Residential

30 Oakdale Street, Jamaica Plain (2 households)

Business

878-80 Columbus Avenue, Roxbury (B&C Proprieter Gas Station)
1 & 2 Columbus Avenue, Roxbury (Merit Gas Station)
1211-19 Tremont Street, Roxbury (Donald D. Stewart Auto Body)
1533 Columbus Avenue, Roxbury (Shell Oil Gas Station)
53 Hyde Park Avenue, Jamaica Plain (Scot Gas Station)
45-51 Hyde Park Avenue, Jamaica Plain (Hatoff Gas Station)
17 Hyde Park Avenue, Jamaica Plain (Freddy's Amoco Station)

The state highway department has leased two of the properties it acquired to tenants on a one month notice arrangement. It does not have the responsibility for relocating these occupants:

1170 Columbus Avenue (The Third Nail, Inc.)
Green Street (ESAC Outpost)

The occupants of these structures are non-profit organizations and were not occupants at the time of taking. At the time of occupancy each potential new tenant was informed that the structure was to be used for transportation purposes and that any occupancy was clearly to be temporary and at the sole option of the owner.

Alternatives to displace either tenant would consist of revisions to the proposed transit/rail alignment in both instances and to the cross-section of the proposed Arterial Street alignment in the instance of 1170 Columbus Avenue. A revision to the transit/rail alignment would require the acquisition of additional property to the side of the alignment opposite the two properties (to the west and east respectively) and could adversely impact existing privately owned business properties on Terrace Street in Roxbury and on Amory Street in Jamaica Plain. In both cases, this alternative would involve the taking of several active businesses because of limitations on the degree of curvature allowable for railroad purposes and the necessity for widening the right-of-way for the addition of the fifth track and station platforms.

In Roxbury another alternative would be to significantly narrow the right-of-way of the proposed arterial street (Segment 2). This could only be done by eliminating shoulders, the median strip and left-turn channelization. This would result in serious congestion at the Roxbury Crossing intersection. It should also be noted that alternatives PHP-1 and PHP-2 raise the existing grade at both locations and cover portions of the ground levels of the structure.

Finally, if these structures are not demolished, it would be necessary to relocate the Stoney Brook culvert at this location.

IV PROPERTY AFFECTED BY POST-HEARING ALTERNATIVES PHP-1 AND PHP-2

Fig. K-5 identifies the property affected by the Post-Hearing Alternatives PHP-1 and -2.

(FIG. K-1)

HOUSEHOLD CHARACTERISTICS OF OCCUPANTS

OF AFFECTED PROPERTIES

	South End	Jamaica Plain	Total
Number of Persons:	44	46	90
Number of Households:	39	24	63
Persons/Household	1.1	1.9	1.4
Age Composition under 19	n.a.	n.a.	n.a.
19	2		2
20-29	17	11	28
30-39	12	9	21
40-49	5	5	10
50-59	3	5	8
60 and over	5	16	21
	44	46	90 persons
Occupation			
Professional, technical	9	1	10
Managers, administrators	3	2	5
Sales	7		7
Clerical	2	2	4
Craftsmen, foremen	1	5	6
Laborers	4	8	12
Service	3	3	6
Private household			
Students	9		9
At home	2	17	19
Retired	4	9	13
	44	46	90
Length of Residence			
Same persons listed in 1973	12	33	45
Same persons listed in 1970	5	23	28

Source: City of Boston List of Persons, 1975

(FIG. K-2)

CHARACTERISTICS OF RESIDENTS AND HOUSING OF BLOCKS IN

WHICH AFFECTED PROPERTIES ARE LOCATED, 1970

	South End			Jamaica Plain								City of Boston
	Block 305	Block 306	Census Tract 703	Block 805	Block 404	Block 301	Block 210	Block 108	Block 106	Block 308	Block 205	
Persons/Household	1.7	1.7	1.9	3.4	3.1	3.6	3.4	3.0	2.8	2.3	2.9	2.9
Percent Black	4%	0	5	0	0	0	1	5	16	0	55	16
Percent under 18	4%	16	9	41	34	29	37	32	31	21	38	28
Percent 62 + over	28%	13	22	10	17	14	16	20	19	24	12	16
Percent renters	95%	77	85	56	67	53	74	76	91	95	72	73
Average Contract rent	$89	117	112	77	79	69	73	95	55	88	73	113
Average no. of rooms	1.9	2.3	2.5	5.0	4.6	4.1	4.6	4.6	4.4	4.2	4.5	3.9

Source: U.S. Census, Block Statistics, 1970

Note: 18-20 St. Charles and 20-26 Cazenove are in Block 305, CT 703
256 Columbus Avenue is in Block 306, CT 703
3834-3836 Washington Street are in Block 805, CT 1101
117 and 123 McBride Street ar in Block 404, CT 1202

142 Carolina Ave. are in Block 210, CT 1204
165 Green Street is in Block 108, CT 1202
90 Mozart Street is in Block 106, CT 1205
129-131 and 133-135 are in Block 308, CT 1203
301-303 Highland Ave. is in Block 205, CT 814

(FIG. K-3)

ESTIMATED NUMBER OF HOUSEHOLDS TO BE RELOCATED

	Household Size		Total
	One person	More than one person	Households
South End			
owner			
non-elderly		2	2
renter			
elderly (60+)	2	2	4
non-elderly	31	1	32
disabled	1		1
Jamaica Plain			
owner			
elderly	1	6	7
non-elderly	1	1	2
renter			
elderly	3		3
non-elderly	2	10	12
Total	41	22	63

Source: City of Boston List of Persons. 1975

(FIG. K-4)

IMPACT OF RELOCATION ON BUSINESS PROPERTY

John Stuart, Inc.
9 Berkeley Street, Boston

SIC Code	5021
Type of Business	Wholesale furniture store
Tenure	Owns premises
Floor Area	Approximately 4,600 sq. ft.
Employees	Not known
Value of Property	$165,400 (assessed value, 1974)
Site Requirements	Large unobstructed floor area, loading access, low rent, probably same vicinity.

Mac-Ellis Tires
258 Columbus Avenue, Boston

SIC Code	5531
Type of Business	Retail store for auto tires, wheels, parts
Tenure	Renter
Floor Area	Approximately 1500 sq. ft.
Employees	Not known
Rent	Not known
Site Requirements	Similar floor area, loading access, probably same vicinity

Garnet Lounge
264 Columbus Avenue, Boston

SIC Code	5813

Type of Business	Tavern
Tenure	Rental
Floor Area	Approximately 1400 sq. ft.
Employees	Not known
Rent	Not known
Site Requirements	Similar floor area, same vicinity. Transfer of liquor license a problem.

Northeastern University
Huntington Avenue, Boston

SIC Code	
Type of Business	School
Tenure	Owns land
Floor area	
Employees	Not known
Value	
Site Requirements	Parking spaces either at grade or in structure to replace places taken.

Davis Monumental Works, Inc.
3805-3811 Washington Street, Jamaica Plain

SIC Code	5999
Type of Business	Monuments and tombstones

Tenure	Owns premises
Site Area	13,800 sq. ft.
Employees	Not known
Value of Property	$9,500 (assessed value, 1974)
Site Requirements	Similar site area, proximity to cemetery, view from main street

Fruit Stand
3819 Washington Street, Jamaica Plain

SIC Code	5431
Type of Business	Retail fruit and vegetable stand
Tenure	Owns premises (assumed)
Site Area	5,600 sq. ft.
Employees	Not known
Value of Property	$2,000 (assessed value, 1974)
Site Requirements	Similar site area, passing traffic. Partial taking which will necessitate access changes.

Kehian Real Estate
3825 Washington Street, Jamaica Plain

SIC Code	6531
Type of Business	Real Estate office
Tenure	Owns premises
Site Area	7,000 sq. ft.
Employees	Not known
Value of Property	$4,000 (assessed value, 1974)
Site Requirements	Office space, probably in the same neighborhood. Partial taking which will necessitate access changes.

AAA Auto Parts
420 Amory Street, Jamaica Plain

SIC Code	5531
Type of Business	Used auto parts
Tenure	Owns premises (assumed)
Site Area	11,000 sq. ft.
Employees	Not known
Value of Property	$3,800 (assessed value, 1974)
Site Requirements	Similar site area. There is a problem of finding sites for this type of use.

Cappy's Towing and Wrecking
41 Amory Street, Jamaica Plain

SIC Code	5521
Type of Business	Used car dealer
Tenure	Owns premises
Site Area	38,130 sq. ft.
Employees	Not known
Value of Property	$16,000 (assessed value, 1974)
Site Requirements	Similar site area, location in vicinity. Removal and storage of used cars may be a problem. Possibility of partial taking and expansion on to adjacent site. Partial taking of land will not affect structure but necessitate rearrangement of site. Possibility of expansion onto adjacent site.

Type of Business	Workshop and store for used merchandise
Tenure	Owns premises
Floor area	
Employees	Not known
Value	$435,000 (assessed value, 1974)
Note	Partial taking which will remove shed at lower level, but will leave main structure untouched. Effect on business operation will be minimal

Liberty Service Station
75 Clarendon Street, Boston

SIC Code	5541
Type of Business	Service station
Tenure	Property owned by Mobil Oil
Site Area	12,141 sq. ft.
Employees	Not known
Value	$48,000 (assessed value, 1974)
Note	Partial taking which will remove corner of lot without touching the structure. Effect on business operation will be minimal.

Boston Arena Authority
238 St. Botolph Street, Boston

SIC Code	7941
Type of Business	Sports arena

Tenure	Owns premises
Employees	Not known
Value	$600,000 (assessed value, 1974)
Note	Partial taking will remove part of parking area at back of arena. Effect on business operation not known.

American Cellophane & Plastic Films Corp.
19 Bartlett Square, Jamaica Plain

SIC Code	2821
Type of Business	Plastics manufacturing plant
Tenure	Owns premises
Site Area	167,000 sq. ft.
Employees	Not known
Value	$230,400 (assessed value, 1974)
Note	Partial taking will remove railroad spur and thus discontinue freight deliveries. Effect on business operation not known.

Hanson Contracting Co.
18 Bartlett Sq. Jamaica Plain

SIC Code	1511
Type of Business	General contractor
Site Area	6,000 sq. ft.
Employees	Not known

Value of Property	$14,300 (assessed value, 1974)
Site Requirements	Partial taking of present access. Effect on business operation not known, but apparently insignificant.

American Legion Post #76
400 Arborway, Jamaica Plain

SIC Code	8641
Type of Business	Club premises
Site Area	4,700 sq. ft.
Employees	Not known
Value of Property	Not known
Site Requirements	Similar site area, parking location in vicinity.
Note	Premises has liquor license. Possibility of moving building to or rebuilding on adjacent vacant site.

Fran & Pat's Sub Shop
154 Green Street, Jamaica Plain

SIC CODE	5812
Type of Business	Eating Place
Tenure	Rental
Area of Premises	1,000 sq. ft. (est.)
Employees	Not known
Rental	Not known
Site Requirements	Similar size of premises, probably in neighborhood.

Arsenault Saw Service
156 Green Street, Jamaica Plain

SIC Code	7699
Type of Business	Saw sales and service
Tenure	Rental
Area of Premises	2,000 sq. ft. (est.)
Employees	Not known
Site Requirements	Similar size of premises, location probably flexible.

Arkin Furniture Co.
160 Green Street, Jamaica Plain

SIC Code	5712
Type of Business	Retail furniture store
Tenure	Rental
Area of Premises	4,000 sq. ft. (est.)
Employees	Not known
Rental	Not known
Site Requirements	Similar size of premises, low rental, same vicinity.

Junkyard
Adjacent to 352 Amory St., Jamaica Plain

SIC Code	5093
Type of Business	Used parts, scrap metal
Tenure	Rental (assumed)
Site Area	2,000 sq. ft. (est.)
Employees	Not known
Rental	Not known

Site Requirements	Similar site area. There is a problem of finding sites for this type of use.

Bill's Auto Service
126 Boylston Street, Jamaica Plain

SIC Code	7531
Type of Business	Automobile and auto body repairs
Tenure	Owner (assumed)
Site Area	
Employees	Not known
Value of Property	Not known
Site Requirements	Similar site area, location probably flexible.

Garage for Two Cars
95 Mozart Street, Jamaica Plain

SIC Code	
Type of Business	Rental of garage space
Tenure	Owner (assumed)
Area of Premises	1,000 sq. ft. (est.)
Employees	None
Value of Property	Not known
Site Requirements	Owner will probably give up this source of income when property is taken.

Colourpicture Publishers, Inc.
76 Atherton Street, Jamaica Plain

SIC Code	
Type of Business	

Tenure	Property affected comprises land owned by the MDC and MBTA, and leased to Colourpicture Publishers, Inc. Sheds are property of Colourpicture.
Area of Premises Affected	Three sheds: total area, 2,500 sq. ft. (est.)
Employees	Sheds are used for storage, no employees affected
Vlue of Property	Not known
Site Requirements	Partial taking will remove storage sheds which can be reinstalled on existing property (probably). Effect on business operation minimal.

La Casa Alegre
1407 Tremont Street, Roxbury

SIC Code	5997
Type of Business	Gift shop
Tenure	Rental
Area of Premises	1,000 sq. ft. (est.)
Employees	Not known
Rental	Not known
Site Requirements	Similar size premises in vicinity. Possibility of relocation into premises in new station building, if rentals can be held low. Temporary premises required.

Able TV
1411 Tremont Street, Roxbury

SIC Code	7622

Type of Business	TV Sales and service
Tenure	Rental
Area of Premises	1,000 sq. ft. (est.)
Employees	Not known
Rental	Not known
Site Requirements	Same as for La Casa Alegre, above.

Stony Brook Tavern, Inc.
1415 Tremont Street, Roxbury

SIC Code	5813
Type of Business	Tavern
Tenure	Rental
Area of Premises	1,000 sq. ft. (est.)
Employees	Not known
Rental	Not known
Site Requirements	Same as for La Casa Alegre, above. Relocation of liquor license a problem.

Athena Market
1419 Tremont Street, Roxbury

SIC Code	5411
Type of Business	Grocery store
Tenure	Rental
Area of Premises	1,000 sq. ft. (est.)
Employees	Not known
Rental	Not known
Site Requirements	Same as for La Casa Alegre, above.

Discount Tire Mart
1414 Tremont Street, Roxbury

SIC Code	5531
Type of Business	Retail store for tires
Tenure	Rental
Area of Premises	2,000 sq. ft. (est.)
Employees	Not known
Rental	Not known
Site Requirements	Similar size premises, location fairly flexible.

Cardarelli & Son
1420 Tremont Street, Roxbury

SIC Code	1761
Type of Business	Roofing contractor
Tenure	Rental
Area of Premises	2,000 sq. ft. (est.)
Employees	Not known
Rental	Not known
Site Requirements	Similar size premises, location fairly flexible.

Parker Hill - Fenway Neighborhood Employment Center
1424 Tremont Street, Roxbury

SIC Code	9389
Type of Business	Employment center
Tenure	Rental
Area of Premises	2,000 sq. ft. (est.)

Employees	Not known
Rental	Not known
Site Requirements	Similar size premises in immediate vicinity.

Corner Tavern, Inc.
109 Lamartine Street, Jamaica Plain

SIC Code	5813
Type of Business	Tavern
Site Area	1,970 sq. ft.
Tenure	Owner (asumed)
Employees	Not known
Value of Property	$7,000 (assessed value, 1975)
Site Requirements	Similar sized site in neighborhood. Transfer of liquor license may be a problem.

Kilgarriff's Cafe, Inc.
131 Green Street, Jamaica Plain

SIC Code	5813
Type of Business	Tavern
Site Area	10,320 sq. ft.
Tenure	Renter (assumed)
Employees	Not known
Value of Property	$14,000 (assessed value, 1975)
Site Requirements	Partial taking only which will require changes to pedestrian and driveway access. Effect on business operations should be minimal.

Kinney Vacuum
3529 Washington Street, Jamaica Plain

SIC Code	
Type of Busines	Railroad supplies and equipment business
Site Area	Not known
Tenure	Renter (assumed)
Employees	Not known
Value of property	Not known
Site Requirements	Partial taking which will require changes to access. Effect on business operations should be minimal.

Jenney Oil Co.
3651 Washington Street

SIC Code	
Type of Business	
Site Area	Not known
Tenure	Owner (assumed)
Employees	Not known
Value of Property	Not known
Site Requirements	Partial taking which will affect presently vacant site. Effect on business operations should be minimal.

Mass Variety
400 Massachusetts Avenue, South End

SIC Code	
Type of Buisness	Variety store
Site Area	Ground Floor-abandoned building
Tenure	Renter
Employees	Not known
Value of property	Not applicable
Site requirements	Building to be demolished

Argosy Printing
166 Terrace Street, Mission Hill

SIC Code	
Type of Business	Printing Plant
Site Area	Approximately 10,000 sq. ft.
Tenure	Basement renter
Employees	Not known
Value of Project	Not known
Site Requirements	Revisions to windows and access to basement level of building required

H. Fleishmann
38 New Heath Street, Mission Hill

SIC Code	
Type of Business	Warehousing
Site Area	Approximately 12,000 sq. ft.
Tenure	Owner
Employees	Not known
Value of Project	Not known
Site Requirement	Revision to access to site required

Former Croft Brewery
41 New Heath Street, Mission Hill

SIC Code	
Type of Business	Small scale tenants-business/residential
Site Area	Approximately 11,000 sq. ft.
Tenure	Unknown
Employees	Not applicable
Value of Project	Not known
Site Requirement	Minor revisions to windows and access to building

(FIG. K-5)

PROPERTY AFFECTED

POST-HEARING ALTERNATIVE (PHP-1, - 2)

OWNERSHIP:

C - Privately-owned, commercial

R - Privately-owned, residential

P - Owned by City of State agencies

N - Non-Profit

IMPACT ON:

L - Land Only

B - Building Only

V - Vacant Lot

IMPACTED BY:

R - Rail (Railroad and transit)

A - Arterial Street

S - Cross-streets or local streets

ACQUISITION:

F - Full - full acquisition; residents to be relocated.

P - Partial - Partial acquisitions; business or residence to remain.

D - Damage - Terms to be determined.

E - Easement - Terms to be determined.

For Residential or Commercial Property owned by the DPW see Section K-III.

Address	Owner-Ship	Impact On	Impact By	Type	Acquisition Remarks
3825 Washington	C	L	S	P	Relocate access, construct wall
3823 Washington	R	L	S	P	Relocate access, construct wall
3819 Washington	R/C	L	S	P	Relocate access, construct wall, raise structure
3805/3811 Washington Davis Monuments	C	L	S	F	Relocate access, construct wall
3834-36 Washington	R	L/B	S	F	Slope construction
Adjacent to 3828 Auto Sales	C	L/B	S	F	Slope construction
Asticou Parking	P	L	R	F	Transit yard, slope construction
8 Asticou Road	R	L	R	E	Slope construction
400 Arborway, American Legion Post #76	N	L/B	S	F	Street construction
3694/3698 Washington (Liquor Store)	C	L	R	D	Relocate access, construct wall
Adjacent to 3694 (Parking Lot)	C	L	S	E	Relocate access; construct wall & slope
3651 Washington (Jenney Oil Co.)	C	L	R	P	Slope construction Tanks not affected
Washington & McBride - South (Kinney Vacuum)	C	L	A/S	D/E	Relocate access; construct wall
144-166 McBride (Boston Gas)	C(P)	L		D/E	Relocate access; construct wall
19 Bartlett Square (American Cellophane)	C	L	A/S	D/E	Relocate access, construct wall, Railroad Siding taken
18 Bartlett Sq. (Hanson Contr. Co.)	C	L	A	D/E	Relocate access (Required for Arterial)
95-97 McBride	R	L	S	E	Construct wall & new driveway
101 McBride	R	L	S	E	Construct wall & new driveway
117 McBride	R	L/B	S	F	Slope construction
123 McBride	R	L/B	S	F	Slope construction
96 McBride	P	L	S	E	Wall construction
42 Lee	R	L	S	E	Wall construction
110 McBride	R	L	S	E	Construct wall & new driveway
113-115 Child	R	L	S	E	Construct slope & new driveway
117-123 Child	R			D/E	Wall construction; one driveway taken
120 Child	R	L	S	E	Construct sloe & new driveway
116 McBride	R	L	S	E	Slope construction & new driveway

Address	Owner-Ship	Impact On	Impact By	Type	Acquisition Remarks
89 Call	R	L	S	E	Construct slope & wall
113 Carolina	R	L	S	E	Construct slope
127 Carolina	R	L	S	E	Construct wall & drive-way
131 Carolina	R	L	S	E	Construct wall & drive-way
135 Carolina	R	L/B	S	E	Slope construction
137 Carolina	R	L/B	S	E	Slope construction
30 John Andrew	R	L	S	E	Slope construction
140 Carolina	R	L/B	S	E	Slope construction
142 Carolina	R	L/B	S	F	Slope construction
St. Mark Street Old Boston & Providence Yard	(Owner-ship unknown)	V	R	F	Widened R.O.W.
30 Everett	R	L	R	P	Widened R.O.W.
28 Everett	R	L	R	P	Widened R.O.W.
14 Gordon	R	L	S	E	Construct slope & new driveway
15 Gordon	R	L	S	E	Slope construction
15A Gordon	R.	L	S	E	Construct slope & new driveway
13 Gordon	R	L	S	E	Construct slope & new driveway
109/115 Green	R/C	V	S	E	Slope construction
117 Green	R	V	S	E	Parking lot, slope con-construction
131 Green (Kilgarriff's)	C	B	S	D/E	Construct wall and new entry
Green & Oakdale (Johnson Playground)	P	L	S	P/E	Construct wall & cul-de-sac
149-155	-	V	S	E	Slope construction
157-161 Green	C	V	S	E	Slope construction
165 Green	R	B	S	E	Slope construction
169-173 Green	R/C	B	S	E	Construct wall; modify entry
154-160 Green	C	B	S	F	Slope construction
162-170 Green (Parking Lot)	C	L	S	E	Wall construction
420-428 Amory (AAA Salvage Co.)	C	L	S	F	Construct Relocated Amory Street (required for Arterial)
22 Everett St.	R	L	R	D	Construct wall

Address	Owner-Ship	Impact On	Impact By	Type	Acquisition Remarks
267 Amory (J.M.Brown Co.)	C	B/L	S	F	Slope construction (required for Arterial)
Boylston & Lamartine (MDC Playground. abandoned)	P	L	S/R	F	Construct Relocated Lamartine St. & Boylston St. Station
127-137 Lamartine	-	V	S	E	Slope construction
123 Lamartine	-	V	S	E	Slope construction & driveway
121 Lamartine	C	B/L	S	E	Slope construction & driveway
113 Lamartine	-	V	S	F	Slope construction
113 Lamartine	R	B/L	S	F	Slope construction
89 Mozart	R	L	S	E	Wall construction
91 Mozart	R	L	S	E	Wall construction
93 Mozart	R	L/B	S	E	Wall construction, modify yard and walk.
(95) Mozart	C	L/B	S	F	Two-car garage
68 Chestnut	R	L	S	E	Slope construction
88 Mozart (Abandoned)	-	L/B	S	F	Slope construction
90 Mozart	R	L/B	S	F	Construct slope; house to be raised
92 Mozart	-	V	S	F	Slope construction
109 Lamartine	C	L/B	S	F	Slope construction
125 Boylston	-	V	S	F	Slope construction
129-131 Boylston	R	B	S	F	Slope construction
133-135 Boylston	R	B	S	F	Slope construction
126 Boylston	C	L/B	S	F	Slope construction
128 Boylston (Church Lot)	N	L	S	E	Slope construction
76 Atherton (Color-Pic. Publ. Inc.)	C	L	S	P/D	Construct wall; relocate access; remove sheds on publicly owned land
Adjacent to 87 Atherton	-	V	S	E	Slope construction
87 Atherton	R	L	S	E	Wall construction, revise steps
83 Atherton	R	L	S	E	Slope construction
79 Atherton	R	L	S	E	Slope construction
125 Amory	P	L	A	D/E	Slope construction (required for Arterial)
17-19 Lamartine	R	L	S	E	Construct slope & new driveway
11-13 Lamartine	R	L	S	E	Construct slope & new driveway
41 Amory (Cappy's Towing & Wreckor Co.)	C	L	R/S	F	Slope construction
262-268 Centre	R	L	S	P	Construct slope, revise entry & relocate street

Address	Owner-Ship	Impact On	Impact By	Type	Acquisition Remarks
Bromley/Heath Public Housing	P	L/B	S/R	D/E	Construct wall & new driveways
Albert St. Playground	P	L	S/R	P	Slope & deck construction
31 Heath	C			P	Construct wall; modify access
294-296 Highland	-	V	S	F	Construct wall & slope
295 Highland	C	L	S	E	Raise sidewalk & driveway
156 Centre	R	L	S	E	Raise sidewalk
160-162 Centre	R	L	S	E	Raise sidewalk & driveway
166-170 Centre	-	L/B	S	F	Slope construction
301-303 Highland	R	B	S	F	Slope construction
110-118 Terrace	-	V	S	F	Construct Cedar St. Ext.
1414-1420 Tremont	C	B	S/R	F	Construct wall & station
1422-1424 Tremont (4-16 Terrace)	C/R	B	S/R	F	
4-16 Terrace 12-22 Gurney	C/ R	L	S	E	Construct wall
1407-1419 Tremont	C	B	S	F	Construct slope; relocate business to Roxbury Crossing station
1423 Tremont	C	V	S	E	
1427-1429 Tremont	R	B	S	D/E	Reconstruct entry
1437-1439 Tremont	C	V	S	E	
Gurney & Tremont (Boston Edison)	C	L	S	P	Construct Gurney St. Ext.
Mission Hill Public Housing	P	L	S	P	Construct relocated Albert Street
Ruggles & Forsyth (Northeastern Univ. Parking)	C	L	R	P	Construct access to Ruggles St. station; widened R.O.W.
Columbus & Ruggles	C	L	R	F	Construct Ruggles St. Station
776-796 Columbus Ave. (former Penn Central					
NW Corner of Mass. Ave. & Railroad (Cleared Parcels)	P	V	R	P	Widened R.O.W. (Boston Arena Parking)
389-393 Mass. Ave.	P	B	R	F	Underpin building, if possible
390-400 Mass. Ave.	P	B	R	F	Underpin building, if possible
West Rutland Square Park	P	L	R	P	Widened R.O.W. (construction anticipated in deed to park
285 Columbus Avenue Heath Building	C	B	R	P	Widened R.O.W. (Underpin building)
Buckingham Street (National Garage)	C	B	R	P	Widened R.O.W. (Underpin building)
75 Clarendon (Liberty Service Gas Station)	C	L	R	P	Widened R.O.W.

Address	Owner-Ship	Impact On	Impact By	Type	Acquisition Remarks
260 Columbus (Garnet Lounge)	C	B	R	F	Widened R.O.W.
258 Columbus (MacEllis Tire Store)	C	B	R	F	Widened R.O.W.
256 Columbus (Continental Apts.)	R	B	R	F	Widened R.O.W.
75 Clarendon	C	L	R	P	Revise access
20-26 Cazenove (Multi-family)	R	B	R	F	Widened R.O.W. (Underpin #20, if possible)
18-20 St. Charles Row-houses	R	B	R	F	Widened R.O.W.
90 Berkeley - (John Stuart Furniture Co.)	C	B	R	F	Widened R.O.W.
35 Berkely (Morgan Memorial Inc., Metal shed only)	N	B	R	P	Widened R.O.W. close entry from railroad right-of-way
19 Albemarle St.	R	L/B	R	E	Construct wall
1-12 Albemarle St.	R	L/B	R	E	Construct wall
17 Blackwood St.	R	L/B	R	E	Construct wall
12 Blackwood St.	R	L	R	E	Construct wall
31 Cumberland St.	R	L/B	R	E	Construct wall
30 Cumberland St.	R	L/B	R	E	Construct wall
17 Durham St.	R	L	R	E	Construct wall
18 Durham St.	R	L/B	R	E	Construct wall
230 West Newton St.	R	L	R	E	Construct wall
231 West Newton St.	R	L	R	E	Construct wall
23 Follen St.	R	L/B	R	E	Construct wall
22 Follen St.	R	L/B	R	E	Construct wall
17 Harcourt St.	C	L/B	R	E	Construct wall
38 New Heath St. (J. Fleishman)	C	L	R	D/E	Revise driveway access
41 New Heath St. (former Croft Brewery)	C	B	R	D/E	Raise sidewalk, close basement windows
166 Terrace St. (Argosy Printing)	C	B	R	D/E	Raise sidewalk, close basement windows and revise entry
22 Everett St.	R	L	R	P	Construct Wall

Address	Owner-Ship	Impact On	Impact By	Type	Acquisition Remarks
395 Mass. Ave.	R	L	R	E	Construct facing wall
402 Mass. Ave.	R/C	L	R	E	Construct facing wall, revise alley
32 Wellington St.	R	L	R	E	Construct wall, revise alley
33 Wellington St.	R	L	R	E	Construct wall, revise alley
36 Claremont Pk.	R	L	R	D	Construct wall, revise alley
33 Claremont Pk.	R	L	R	E	Construct wall
1 Claremont St.	R	B	R	E	Raise sidewalk
2 Claremont St.	R	B	R	E	Raise sidewalk
3 Claremont St.	R	B	R	E	Raise sidewalk, revise alley
40 Greenwich Pk.	R	L	R	D	Construct wall, revise alley
39 Greenwich Pk.	-	L	R	E	Construct wall
4 Clarmont St.	-	V	R	D	Construct wall, revise alley
40 Braddock Pk.	-	V	R	E	Construct wall
43 Braddock Pk.	R	L	R	D	Construct wall, revise alley
40-42 Holyoke St.	P	L	R	E	Construct wall, revise alley
39 Holyoke & (6 Carleton St.)	P	L	R	D	Construct wall, revise alley
240 W. Canton St.	P	L	R	E	Construct wall, revise alley
245 W. Canton St.	P	L	R	E	Construct wall, revise alley
36 Yarmouth St.	-	V	R	D	Construct wall, revise alley
88 Berkeley St.	R	B	R	E	Construct facing wall
16 St. Charles St.	R	B	R	E	Construct facing wall
16 Casenove St.	R	B	R	E	Construct facing wall
Camden St. at Railroad	-	V	R	D	Construct wall
5,21,23 former Watson Street (Temporary Carter Sch.)	P	B	R	D	Construct wall (Building relocated)
Northampton St. at Railroad	-	V	R	D	Construct wall
30 Claremont Pk.	R	L	R	E	Revise alley
32 Claremont Pk.	R	L	R	E	Revise alley
36 Claremont Pk.	R	L	R	E	Revise alley

Address	Owner-Ship	Impact On	Impact By	Type	Acquisition Remarks
34 Greenwich Pk.	R	L	R	E	Revise alley
36 Greenwich Pk.	R	L	R	E	Revise alley
38 Greenwich Pk.	R	L	R	E	Revise alley
35 Greenwich Pk.	R	L	R	E	Revise alley
1, 2, 3, 4, 5 Carleton St.	-	V	R	E	Construct slope, revise alley
34 Braddock Pk.	R	L	R	E	Revise alley
37 Braddock Pk.	R	L	R	E	Revise alley
39 Braddock Pk.	R	.	R	E	Revise alley
41 Braddock Pk.	R	L	R	E	Revise alley
36 Holyoke St.	R	L	R	E	Revise alley
38 Holyoke St.	R	L	R	E	Revise alley
223 W. Newton St.	R	L	R	E	Construct wall, revise sidewalk
234 W. Canton St.	R	L	R	E	Revise alley
236 W. Canton St.	R	L	R	E	Revise alley
238 W. Canton St.	R	L	R	E	Revise alley
239 W. Canton St.	R	L	R	E	Revise alley
241 W. Canton St.	R	L	R	E	Revise alley
243 W. Canton St.	R	L	R	E	Revise alley
30 Yarmouth St.	R	L	R	E	Revise alley
32 Yarmouth St.	R	L	R	E	Revise alley
34 Yarmouth St.	R	L	R	E	Revise alley
Parking lot corner of Stanhope & Clarendon Streets	C	L	S	P	Widen street
Mass Turnpike Auth. @ Dartmonth St. & railroad R.O.W.	P	L	R	P	Revise ramp to accommodate track realignments for station.
Lot @ Hall, Boynton & Call Sts.	C	V	R	F	Relocate Call St.
85 Mozart St.	R	L	S	E	Construction Easement
87 Mozart St.	R	L	S	E	Construction Easement
86 Mozart St.	R	L	S	E	Construction Easement
Boylston Cong. Church Boylston and Amory	N	L	S	E	Construction Easement
211 Amory	-	V	S	E	Construction Easement
78 Boylston St.	C	L	S	E	Construction Easement
90 Boylston St.	-	V	S	F	Construction Easement
239 Lamartine St.	R	L	S	E	Construction Easement

Address	Owner-ship	Impact On	Impact By	Type	Acquisition Remarks
243 Lamartine St.	R	L	S	E	Construction Easement
247 Lamartine St.	R	L	S	E	" "
251 Lamartine St.	R	L	S	E	" "
253 Lamartine St.	R	L	S	E	" "
257 Lamartine St.	R	L	S	E	" "
261 Lamartine St.	R	L	S	E	" "
265 Lamartine St.	R	L	S	E	" "
260 Lamartine St.	R	L	S	E	" "
262 Lamartine St.	R	L	S	E	" "
161 Lamartine St.	C	L	S	E	" "
169 Lamartine St.	-	V	S	F	" "
2 Lamartine Place	R	L	S	E	" "
3 Lamartine Place	R	L	S	E	" "
9 Oakdale St.	R	L	S	E	" "
1 Cerina Road	R	L	S	E	" "
2 Cerina Road	R	L	S	E	" "
19 Oakdale St.	R	L	S	E	" "
Oakdale Terr. Owner Unknown	R	L	S	E	" "
Amory St. Stony-Brook owner unknown	-	V	S	E	" "
276 Amory St.	R	L	S	E	" "
280 Amory St.	R	L	S	E	" "
286 Amory St.	R	L	S	E	" "
288 Amory St.	R	L	S	E	" "
290 Amory St.	R	L	S	E	" "
292 Amory St.	R	L	S	E	" "
296 Amory St.	R	L	S	E	" "
300 Amory St.	R	L	S	E	" "
304 Amory St.	R	L	S	E	" "
308 Amory St.	R	L	S	E	" "
312 Amory St.	R	L	S	E	" "
314 Amory St.	R	L	S	E	" "
2 Minton St.	R	L	S	E	" "
Minton St. and Amory St. Assessor #2172-1	R	L	S	E	" "
332 Armory St.	R	L	S	E	" "
336 Armory St.	R	L	S	E	" "

Address	Owner-ship	Impact On	Impact By	Type	Acquisition Remarks
342 Amory St.	R	L	S	E	Construction Easement
Amory St. Assessors #2184	R	V	S	E	" "
Amory St. owner unknown	R	L	S	E	" "
Dolan's Court	-	L	S	E	" "
350 Amory St.	R	L	S	E	" "
Cornwall St. Assessors #2180	-	V	S	E	" "
364 Amory St.	R	L	S	E	" "
380 Amory St.	R	L	S	E	" "
Amory St. Assessors #2227	-	V	S	E	" "
Amory St. Assessors #2228	-	V	S	E	" "
392 Amory St.	R	L	S	E	" "
394 Amory St.	R	L	S	E	" "
Amory St. Assessors #2231	-	V	S	E	" "
Amory St. Assessors #2232	-	V	S	E	" "
394 Amory St.	-	V	S	E	" "
211 Amory St.	-	V	S	F	Relocate Boylston St.
402 Amory St.	R	L	S	E	Construction Easement
409 Amory St.	R	L	S	E	" "
408 Amory St.	R	L	S	E	" "
412 Amory St.	R	L	S	E	" "
Amory St. Assessors #2220	-	V	S	E	" "
19 Anson St.	R	L	S	E	" "
432 Amory St.	-	V	S	E	" "
440 Amory St.	-	V	S	E	" "
8 Everett St.	R	L	S	E	" "
Everett St. Assessors #1168	 R	V L	S S	E E	" " " "
22 Everett St.	R	L	S	E	" "
41 Everett St.	R	L	S	E	" "
43 Everett St.	R	L	S	E	" "
45 Everett St.	-	V	S	E	" "
177 Lamartine St.	R	L	S	E	" "

Address	Owner-ship	Impact On	Impact By	Type	Acquisition Remarks
48 Newbern St.	-	V	S	E	Construction Easement
44 Newbern St.	R	L	S	E	" "
Newbern St. Assessors #1225	R	L	S	E	" "
109 Child St.	R	L	S	E	" "
110 Child St.	R	L	S	E	" "
116 Child St.	R	L	S	E	" "
Call St. adjacent to and north of 120 McBride St.	-	V	S	E	" "
110 McBride St.	R	L	S	E	" "
42 Lee St.	R	L	S	E	" "
96 McBride St.	R	L	S	E	" "
72 Boynton St.	R	L	S	E	" "
68 Boynton St.	R	L	S	E	" "
66 Boynton St.	R	L	S	E	" "
Boynton St.	R	L	S	E	" "
Assessors #3172	R	L	S	E	" "
Boynton St. Assessors #3201	-	V	S	E	" "
Boynton St. Assessors #3202	-	V	S	E	" "
Boynton St. Assessors #3203	-	V	S	E	" "
Boynton St. Assessors #3200	-	V	S	E	" "
Hall St. Assessors #3204	-	V	S	E	" "
Hall St. Assessors #3205	-	V	S	E	" "
Hall St. Assessors #3206	-	V	S	E	" "
N.E. Corner South & St. Marks Sts. (Fordham Court Apts.)	R	L	S	P	Construction Cul-de-sac
S.W. Corner Lamartine & Boylston Sts.	I	L	S	E	Revision to Boylston St.
181 Lamartine St.	R	L	S	E	Construction Easement
185-189 Lamartine St.	-	V	S	F	" "
Boylston St. Assessor #37, Ward 19	-	V	S	F	" "

Address	Owner-ship	Impact On	Impact By	Type	Acquisition Remarks
51 Burnett St.	-	V	R	E	Construction Easement
55 Burnett St.	-	V	R	E	" "
57 Burnett St.	R	L	R	E	" "
Washington St. Assessors #2617-2 and 2618	C	L	R	E	" "
36 Rosemary St.	-	V	S	E	" "
234 South St.	R	L	S	E	" "
238 South St.	R	L	S	E	" "
14-14A Asticou Rd.	R	L	S	E	" "
8A Asticou Rd.	R	L	S	E	" "
Orchard Hill Rd. Assessors #3720 and 3721	C	L	S	E	" "
Washington St. Assessors #3719	-	L	S	E	" "
Washington St. Assessors #2718	-	V	S	E	" "
68 Hyde Park Ave.	R	L	S	E	" "
Washington St. Assessors #3715-1 3716 and 3717	-	V	S	E	" "
3696 Washington St.	-	V	S	E	" "
3698-A Washington St.	-	L	S	E	" "
3700 Washington St.	-	L	S	E	" "
3702 Washington St.	-	L	S	E	" "
3704 Washington St.	-	L	S	E	" "
3706 Washington St.	-	L	S	E	" "
3708 Washington St.	-	L	S	E	" "
3710-A Washington St.	-	L	S	E	" "
3724 Washington St.	C	L	S	E	" "
3725-26 Washington St.	C	L	S	E	" "
2 Hyde Park Ave.	C	L	S	E	" "
18-24 Hyde Park Ave.	C	L	S	E	" "
36 Hyde Park Ave.	-	V	S	E	" "
54-33 Hyde Park Ave.	C	L	S	E	" "
56 Hyde Park Ave.	R	L	S	E	" "
60 Hyde Park Ave.	R	L	S	E	" "
64 Hyde Park Ave.	R	L	S	E	" "

Address	Owner-ship	Impact On	Impact By	Type	Acquisition Remarks	
72 Hyde Park Ave.	R	L	S	E	Construction	Easement
76 Hyde Park Ave.	R	L	S	E	"	"
78 Hyde Park Ave.	R	L	S	E	"	"
82 Hyde Park Ave.	R	L	S	E	"	"
92 Hyde Park Ave.	R	L	S	E	"	"
100 Hyde Park Ave.	R	L	S	E	"	"
102 Hyde Park Ave.	R	L	S	E	"	"
106 Hyde Park Ave.	R	L	S	E	"	"
112 Hyde Park Ave.	R	L	S	E	"	"
116 Hyde Park Ave.	R	L	S	E	"	"
120 Hyde Park Ave.	R	L	S	E	"	"
124 Hyde Park Ave.	R	L	S	E	"	"
130 Hyde Park Ave.	R	L	S	E	"	"
132 Hyde Park Ave.	R	L	S	E	"	"
138 Hyde Park Ave.	R	L	S	E	"	"
2-4 Walk Hill St.	R	L	S	E	"	"
8-6 Walk Hill St.	R	L	S	E	"	"
8A-10A Walk Hill St.	R	L	S	E	"	"
12A-14 Walk Hill St.	R	L	S	E	"	"
Hyde Park Ave. Accessors #5053	-	V	R	E	"	"
235 Hyde Park Ave.	R	L	R	E	"	"
249 Hyde Park Ave.	R	L	R	E	"	"
253 Hyde Park Ave.	R	L	R	E	"	"
257 Hyde Park Ave.	-	V	R	E	"	"
261 Hyde Park Ave.	R	L	R	E	"	"
265 Hyde Park Ave.	R	L	R	E	"	"
269 Hyde Park Ave.	R	L	R	E	"	"
3850 Washington St.	R	L	R	E	"	"
Washington St. Toll Gateway	N	L	R	E	"	"
3882-R Washington St.	R	L	R	E	"	"
3890 Washington St.	R	L	R	E	"	"
3822 Washington St.	R	L	R	E	"	"
6 Franklin Place	R	L	R	E	"	"
11 Franklin Place	R	L	R	E	"	"
Franklin Place Assessors #3517	-	V	R	E	"	"
170 Brookway Rd.	R	L	R	E	"	"

Address	Ownership	Impact On	Impact By	Type	Acquisition Remarks
City of Boston for School Purposes between Arboretum and MBTA Parking Area	P	L	R	E	Construction Easement
1178-1322 Tremont St.	P/N	L	A	E	" "
1160 Tremont St.	P/N	L	A	E	" "
1118-1144 Tremont St.	P	L	A	E	" "
837-871 Columbus Ave.	P	L	A	E	" "
22-24 Sarsfield St.	P	L	A	E	" "
7-29 Sarsfield St.	P	L	A	E	" "
18 St. Cyprians St.	N	L/B	A/S	E	" "
20-28 St. Cyprians St.	R	L/B	A/S	E	" "
788 Columbus Ave.	C	B	S	E	" "
775-813 Rear Columbus Ave.	P	B/L	S	E	" "
813 Columbus Ave.	R	B	S	E	" "
140 Forsyth St.	N	L	S/R	E	" "
143 Forsyth St.	N	B	S	E	" "
151 Forsyth St.	N	L	S	E	" "
2-10 Leon St.	N	L	S	E	" "
275-289 Ruggles St.	N	L	S	E	" "
47 Heath St.	P	B	S	E	" "
2-8 Bromley	C	B	S	E	" "
1-7 Bromley	C	B	S	E	" "
36-40 New Heath St.	C	B	S	E	" "
37-41 New Heath St.	C	B	S	E	" "
148-168 Terrace St.	C	B	R/S	E	" "
136-146 Terrace St.	C	L	R	E	" "
120-134 Terrace St.	R	L/B	R	E	" "
94-106 Terrace St.	C	L	R	E	" "
84-88 Terrace St.	P	L	R	E	" "
76-80 Terrace St.	R	L/B	R	E	" "
1-3 New Heath St.	C	L/B	S	E	" "
5-7 New Heath St.	P	L	S	E	" "
Rear 137-141 Centre St.	R	L	A	E	" "
Rear 131-133 Centre St.	P	L	A	E	" "
Rear 129 Centre St.	R	L	A	E	" "
Rear 127 Centre St.	P	L	A	E	" "
Rear 107-125 Centre St.	R	L	A	E	" "

Address	Owner-ship	Impact On	Impact By	Type	Acquisition Remarks
162 Cedar St.	P	L	A/S	E	Construction Easement
Rear 1270 Columbus Ave.	C	L	A	E	" "
Rear 1300 Columbus Ave.	C	L	A	E	" "
47 Lamartine St.	C	B	R/S	E	" "
31-37 Lamartine St.	P	V	R/S	E	" "
21-29 Lamartine St.	R	L/B/V	R/S	E	" "
11-19 Lamartine St.	p	L/V	R/S	E	" "
262-268 Centre St.	R	L/B	S	E	" "
290 Centre St.	P	L/V	S	E	" "
272 Centre St.	R	L/B	S	E	" "
278 Centre St.	R	L	S	E	" "
125 Amory St.	P	L	R	E	" "
40/46 Amory St.	R	B	S	E	" "
32/36 Amory St.	R	B	S	E	" "
1567 Columbus Ave.	C	L	A/S	E	" "
1581 Columbus Ave.	R	L	A/S	E	" "
1589 Columbus Ave.	R	L/B	A/S	E	" "
1590 Columbus Ave.	P	L/B	A	E	" "
1544 Columbus Ave.	C	L/B	A/S	E	" "
Ritchie & Columbus	P	L	S	E	" "
158 Centre St.	R	L	S	E	" "
160/162 Centre St.	R	L	S	E	" "
138 Marcella St.	R	L	S	E	" "
140 Marcella St.	R	L	S	E	" "
151-167 Centre St.	R	L/B	S	E	" "
70-72 Terrace St.	P	L/B	R	E	" "
40-60 Terrace St.	R	L/B	R	F	Slope Reconstruction
20-38 Terrace St.	C	L/B	R	E	Construction Easement
15 Terrace St.	P	Y	S	E	" "
28-30 Gurney St.	R	B	S	E	" "
18-62 Station St.	C	L/V	S	E	" "
17 Station St.	C	B	S/R	E	" "
23-37 Station St.	C	B/L	S	E	" "
45-35 Mindoro St.	C	L	S	E	" "
5 Mindoro St.	N	B	S	E	" "
16-34 Mindoro St.	C	B/L	S/R	E	" "
30 Prentiss St.	C	B	S/R	E	" "

Address	Owner-ship	Impact On	Impact By	Type	Acquisition Remarks
1208-1266 Rear Columbus Ave.	V	L	A/S	E	Construction Easement
24 Gardner	N	B	S	E	" "
1-49 Elmwood	P	L/V	S/A	E	" "
N.E. Corner Gainsborough St. @ R.R.	-	L/B	R	F	Widen R.O.W., Construct Wall
18,20-22 of Former Watson St.	-	L	R	E	Revisions at Temporary School
Former Watson St. from Camden to North-Hampton	-	L	R	E	Revisions at Temporary School
374-378 Mass. Ave.	-	V	R	P	Construct Wall, Raise Sidewalk
223 W. Newton St.	R	L/B	R	E	Construct Wall
34 Braddock Pk.	R	L	R	E	Revise Alley
32 Garrison St.	-	L	R	E	Construct Wall
30 Garrison St.	-	L	R	E	Construct Wall
N.E. Corner of Harwich & Yarmouth Sts.	-	V	R	E	Construct Wall
31 Harwich	-	L	R	E	" "
29 Harwich	-	L	R	E	" "
19-27 Harwich or 130-132 Dartmouth	-	L	R	E	" "
Mass. Turnpike	P	L/B	R	D	Widen R.O.W., Rebuild Ramp
135 Dartmouth St.	-	L	R	E	Construct Wall
20-48 Buckingham (National Garage)	-	L/B	R	D	Underpin Building, Widen R.O.W.
22 St. Charles	-	L	R	F	Widen R.O.W.

L

APPENDIX

Appendix L

LAND DEVELOPMENT POTENTIAL

This appendix tabulates details of the land development potential discussed in Section 7.4.5. The information is presented as follows:

NEIGHBORHOOD	FIGURE NUMBER
Jamaica Plain	L-1 through L-9
Roxbury	L-10 through L-20
South End	L-21 and L-22

Fig. L-1

SUBSTITUTE DEVELOPMENT APPROACHES FOR CERTAIN PARCELS - Jamaica Plain*

Footnote #	Parcel #s Involved	Alternatives Involved	Substitute Development Program	Comments
1	2,3,4	all	76304 S.F. commercial land	Some current uses inconsistent with zoning and future land use effects of station.
2	12	all	20 d.u. MF housing; 10,000 S.F. retail; 10,000 S.F. open space	If a direct connection to the Arboretum cannot be arranged, then the southern part of the site could be developed for private uses.
3	16X	3 and 4 with no Orange Line Extension to West Roxbury	500 to 1000 car parking garage	Parking cannot be accommodated in station area.
4	26	all	open space	Neighborhood play area if housing development proves impossible or undesirable.
5	30	all	sell standing houses - 2 structures; -3 d.u. total	Redraw lot lines to adjust to street realignments and to encompass vacant lots.
6	35,36	1,3	90 d.u. MF housing with open space between housing and tracks	Construction along Call Street would be far enough from tracks to minimize noise impact problems.
7	37	1.2	41,500 S.F. open space or 41,500 S.F. land for housing development	Development should be coordinated with that of parcels 35, 36, 38 and 40X.
8	45	all	open space	If conditions discourage housing development, this could become a useful park especially for young children and elderly.
9	53,54	1	193,000 S.F. land for manufacturing or commercial	May seriously impact existing houses, and Neighborhood House on Amory Street.
10	57	1	3000 S.F. retail plus open space	Small retail near station.
11	60X,61x & adjacent	all	slightly over one acre for a mixed retail, commercial, residential development	Proximity of churches and parks reinforces this block as a potential neighborhood nucleus.

These substitutes apply to the following sections describing proposed land uses for each parcel. They are presented here first to make sure the reader is aware of the possible substitutions as he reads the material.

Fig. L-1 (Continued)
SUBSTITUTE DEVELOPMENT APPROACHES FOR CERTIAN PARCELS

Footnote #	Parcel #s Involved	Alternatives Involved	Substitute Development Program	Comments
12	62X	all	3/4 acre site for elderly housing, nursing home, or commercial	Could borrow from parcel 63 for parking and open space requirements.
13	63	2,4	open space	If satisfactory development cannot be achieved, this should be treated as open space as under alternative 1 and 3.
14	65,66,67 and 68	1,2	medium density housing	Only possible with decking over tracks. If joined with parcels 69 through 74X, this could provide for a major mixed-use development of 10 to 12 acres.

The above table lists a number of substitute development possibilities for certain sites. None of these represents a major change in neighborhood character, but rather suggests a second choice within the constraints imposed by existing surroundings.

Wider ranging development approaches are possible under different policy assumptions such as:

- o Reduce open space and increase amounts of housing, retail and commercial development
- o Rezone for higher housing densities and give other encouragement for denser urban development
- o Encourage manufacturing and commercial development while reducing open space and housing development
- o Create special zones at station areas to encourage higher density mixed-use development
- o Encourage additional new development through development incentives, rezoning, and public acquisition of substandard, non-conforming, and under utilized adjacent real estate

While all of these approaches are theoretically possible, they have not been deeply evaluated in this study because they are not consistent with neighborhood feelings, and because alternative sites are available where such additional development can be accomplished more easily.

The prevailing development objective assumed during this study has been the restoration of the neighborhood to its previous residential character and quality. Emphasis has been placed on continuation of present densities and long term maintainability of the uses proposed.

Notes and symbols:

o Indicates dedication of a portion of the parcel for open space use to accommodate such uses as the Regional Trail, bike path, and a "green belt" concept.

oo Indicates the possibility of providing a community facility as part of the proposed development. This facility could take many forms.

Fig. L-2

LIST OF PROPERTIES TO BE SOLD AS IS

Note	Parcel #	Alternatives	Addresses	Description	Comment
A	2	all		lumberyard houses & land	Alt's. 1, 1b & 2: make adjustments for new street grade before sale.
B	3	all		houses and land	Alt's. 1, 1b & 2: make adjustments for new street grade before sale.
C	10	all	8 Asticou Road	2 family house	Sell after Washington Street extension is built.
D	43X	1b, 2, 4	28 Everett 30 Everett	3 family townhouse 3 family townhouse	Resell to former owners or others after adjusting grades and lot shapes and providing acoustic and visual treatment.
E	44	all	26 Everett	3 family townhouse	Resell for rehabilitation.
F	45	all	22 Everett	1 or 2 family house	Resell for rehabilitation.
G	7X	5,6	3811 Washington 3819 Washington 3823 Washington 3825 Washington	house retail house house	Resell to former owners or others after adjusting for new street profile. A similar approach could be used for alternatives 1 & 2 also, instead of the full taking described there.
H	61b	5,6	177-179 & 181-183 Lamartine	2 family house	Resell to former owners or others after adjusting for new street profile.
I	65a	5,6	90 Mozart St.	house	Resell after relocating structure westward to 88 Mozart Street.

Alt. FH-1 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-3

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG. AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
1	97,500							97,500							
2	51,415		(1)												51,415(A)
3	10,189		(1)												10,189(B)
4	14,700		(1)									14,700			
5	54,726									54,726					
6,7, 8	38,025							38,025					oo		
9	99,000	x						20,000					oo	79,000	
10	2780														2780(C)
11	25,700	x			15		10,000								
12	40,500		(2)									40,500	oo		
13	Station						50,000								
14	Station						18,500								
15	60,000											60,000	oo		
16X	111,900	x	(3)			200	20,000		20,000				oo		
17	20,000											20,000			
18	40,000										40,000		oo		
19X	740,000							20,000			720,000	o			
20X & 21X	43,700							43,700							
22	25,600							25,600							

Alt.# FH-1 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-3 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE - RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG. AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
23	111,000														
24	12,600										12,600			111,000	
25	18,624			2										9624	
26	155,000	x	(4)	60								55,000	oo		
27X	29,415			17											
29	23,051			13											
30	15,821		(5)	8											
31	3387													3387	
32	8386			3											
33	4098			1											
34	19,760													19,760	
35	48,500											48,500	oo		
36	49,000											49,000	oo		
37	future air rights		(7)												
38	50,000											o		50,000	
39a & b	74,000											74,000			
40X	216,700										216,700				
41X	247,400										247,400				

Alt. # FH-1 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-3 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
43X	3300														3300(D)
44	2000														2000(E)
45	42,000	x	(8)		18							o	oo		12000(F)
46	6000	x		2			2000						oo		
48	Station						2400								
49X	27,800	x					5000	17,800					oo		
52	97,000											97,000	oo		
53	110,000		(9)									110,000	oo		
54	83,000		(9)									83,000	oo		
56	151,000											151,000	oo		
57	51,000		(10)									57,000	oo		
58X	12,480													12,480	
59	Station						2400								
60X	21,697		(11)		10		5000								
61X	4550		(11)				4000								
62X	30,879		(12)		18								oo		
63	64,500											64,500	oo		
64	41,000											41,000			
65	14,202		(14)					14,202							

Alt. # FH-1	NEIGHBORHOOD JAMAICA PLAIN			Fig. L-3 Continued				DEVELOPMENT POTENTIAL							
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
66	48,117		(14)					48,117							
67	92,600		(14)					92,600							
68	60,500		(14)									60,500	oo		
69	55,500							55,500				o	oo		
70X	38,130							38,130							
71	100,500	x					15,000	70,500				o	oo		
72	30,931	x					10,000	10,931					oo		
73X	11,867							11,867							
74X	14,177	x			10		5000								
75X	249,562	x								50,000	100,000	49,562	oo		
Greenbelt	38,500											38,500	oo		
Totals				106	71	200	149,300	604,472	20,000	104,726	1,336,700	1,113,762	varies	285,251	81,684

ALT.# FH-2 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-4

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
1	97,500							97,500							
2	51,415		(1)												51,415(A)
3	10,189		(1)												10,189(B)
4	14,700		(1)									14,700			
5	54,726									54,726					
6,7, 8	38,025							38,025					oo		
9	99,000	x						20,000					oo	79,000	
10	2780														2780(C)
11	25,700	x			15		10,000								
12	40,500		(2)									40,500	oo		
13	Station						50,000								
14	Station						18,500								
15	60,000											60,000	oo		
16X	111,900	x	(3)			200	20,000		20,000				oo		
17	20,000											20,000			
18	40,000										40,000		oo		
19X	740,000							20,000			720,000	o			
20	20,400							20,400				o			
21X	8500							8500							

ALT. # FH-2	NEIGHBORHOOD JAMAICA PLAIN			Fig. L-4 Continued	DEVELOPMENT POTENTIAL										
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
22	13,200							13,200							
24	12,600										12,600				
25	18,624			2										9624	
26	155,000	x	(4)	60								55,000	oo		
27X	29,415			17											
29	23,051			13											
30	15,821		(5)	8											
31	3387													3387	
32	8386			3											
33	4098			1											
34	19,760													19760	
35	48,500											48,500	oo		
36	35,500											35,500	oo		
37	future air rts.		(7)												
38	8000											o		8000	
39	11,000											11,000			
40X	216,700										216,700				
41X	247,400										247,400				
43X	3300														3300 (D)

ALT. # FH-2 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-5 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
44	2000														2000(E)
45	42,000	x	(8)		18							o	oo		12,000(F)
46	6000	x		2			2000						oo		
48	Station						2400								
49X	27,800	x					5000	17,800							
50	3541													3541	
51	1000													1000	
52	102,000											102,000	oo		
53	29,000											29,000	oo		
54	23,800											23,800	oo		
55	8400			3											
56	153,000											153,000	oo		
57	6100											6100			
58X	12,480													12,480	
59	Station						2400								
60X	21,697	x	(11)		10		5000								
61X	4550		(11)				4000								
62X	30,879		(12)		18								oo		
63	64,100	x	(13)		18							30,000	oo		

ALT. # FH-2 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-5 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
64	39,500											39,500			
65	14,202		(14)					14,202							
66	48,117		(14)					48,117							
67	92,600		(14)					92,600							
69	15,800							15,800				o	oo		
71	79,000	x					15,000	49,000				o	oo		
73X	11,867							11,867							
74X	14,177	x			10		5,000								
75X	249,562	x								50,000	100,000	49,562	oo		
Greenbelt	350,600											350,600	oo		
Totals				109	89	200	139,300	467,011	20,000	104,726	1,336,700	1,068,762	varies	136,792	81,684

ALT. # FH-3 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-6

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
1	115,000							115,000							
2	51,415		(1)												51,415(A)
3	10,189		(1)												10,189(B)
4	36,000		(1)									36,000	oo		
5	54,726		(1)							54,726					
6	6273							6273							
8	7600							7600							
9	99,000	x						20,000						79,000	
10	2780														2780(C)
11	25,700	x			15		10,000						oo		
12	40,500		(2)									40,500	oo		
14	Station						10,000								
15	60,000						15,000					45,000	oo		
16X	111,900	x	(3)			200	20,000		20,000				oo		
17	20,000											20,000			
18	40,000										40,000		oo		
19X	740,000							20,000			720,000	o			
20X & 21X	43,700							43,700							
22	25,600							25,600							

ALT. # FH-3 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-6 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
23	99,000													99,000	
24	12,600										12,600				
25	18,624			2										9624	
26	182,800	x	(4)	60								82,800	oo		
27X	29,415			17											
28	33,500											33,500	oo		
29	23,051			13											
30	15,821		(5)	8											
31	3387													3387	
32	8386			3											
33	4098			1											
34	19,760													19,760	
35	83,200		(6)									83,200	oo		
36	70,500		(6)									70,500	oo		
38	20,300											o		20,300	
39	22,500											22,500			
40X	216,700										216,700				
41X	247,400										247,400				
42	5735													5735	

ALT. # FH-3	NEIGHBORHOOD JAMAICA PLAIN			Fig. L-6 Continued				DEVELOPMENT POTENTIAL							
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
44	3060														3060(E)
45	51,767	x	(8)		24							o	oo		12,000(F)
46	8563	X		4			3000						oo		
47	3000											3000			
48	Station						2400								
49X	24,000	x					5000	14,000					oo		
52	175,500											175,500	oo		
53	52,500											52,500			
54	49,500											49,500			
56	220,000											220,000	oo		
57	8200											8200			
58X	12,480													12,480	
59	Station						2400								
60X	21,697	x	(11)		10		5000								
61X	4550		(11)				4000								
62X	30,879		(12)		18								oo		
63	65,500											65,500	oo		
64	39,500													39,500	
65	14,202		(14)					14,202							

ALT. # FH - 3 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-6 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
66	48,117		(14)					48,117							
67	92,600		(14)					92,600							
68	52,000											52,000			
69	55,500							55,500				o	oo		
70X	38,130							38,130							
71	100,500	x					15,000	70,500				o	oo		
72	30,931	x					10,000	10,931					oo		
73X	11,867							11,867							
74X	14,177	x			10		5000						oo		
75X	249,562	x								50,000	100,000	49,562	oo		
Greenbelt	38,600											38,600	oo		
Totals				108	77	200	106,800	594,020	20,000	104,726	1,336,700	1,148,362	varies	288,786	79,444

ALT. # FH-4

NEIGHBORHOOD JAMAICA PLAIN

Fig. L-7

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
1	115,000							115,000							
2	51,415		(1)												51,415(A)
3	10,189		(1)												10,189(B)
4	36,000		(1)									36,000	oo		
5	54,726		(1)							54,726					
6	6273							6273							
8	7600							7600							
9	99,000	x						20,000						79,000	
10	2780														2780(C)
11	25,700	x			15		10,000						oo		
12	40,500		(2)									40,500	oo		
14	Station						10,000								
15	60,000						15,000					45,000	oo		
16X	111,900	x	(3)			200	20,000		20,000				oo		
17	20,000											20,000			
18	40,000										40,000		oo		
19X	740,000							20,000			720,000	o			

ALT. # FH-4	NEIGHBORHOOD JAMAICA PLAIN			Fig. L-7 Continued				DEVELOPMENT POTENTIAL							
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
20	20,400							20,400				o			
21X	8500							8500							
22	13,200							13,200							
23	92,000													92,000	
24	12,600										12,600				
25	18,624			2										9624	
26	144,500	x	(4)	60								44,500	oo		
27X	27,300			16											
29	25,700			14											
30	13,700		(5)	6											
31	3387													3387	
32	8386			3											
33	4098			1											
34	19,760													19,760	
35	33,500											33,500	oo		
36	20,500											20,500	oo		
38	20,300											o		20,300	
39	22,500											22,500			

ALT. # FH-4 | NEIGHBORHOOD JAMAICA PLAIN | Fig. L-7 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
40X	216,700										216,700				
41X	247,400										247,400				
45	38,200	x	(8)		12							o	oo		17,300 (D,E,F)
46	5500	x		2			2000					o	oo		
47	12,500	x			6		6000					o	oo		
48	Station						2400								
49X	27,800	x					5000	17,800							
52	57,500											57,500	oo		
53	51,000											51,000			
54	58,500											58,500			
55	7000			2											
56	68,400											68,400	oo		
57	8200											8200			
58X	12,480													12,480	
59	Station						2400								
60X	21,697	x	(11)		10		5000								
61X	4550		(11)				4000								
62X	30,879		(12)		18								oo		
63	83,000	x	(13)		18							50,000	oo		

ALT. # FH-4	NEIGHBORHOOD JAMAICA PLAIN			Fig. L-7 Continued				DEVELOPMENT POTENTIAL							
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
64	28,200											o		28,200	
65	14,202							14,202							
66	48,117							48,117							
67	92,600							92,600							
69	15,800							15,800				o	oo		
71	79,000	x					15,000	49,000				o	oo		
73X	11,867							11,867							
74X	14,177	x			10		5000								
75X	249,562	x								50,000	100,000	49,562	oo		
Greenbelt	417,300											417,300	oo		
Totals				106	89	200	101,800	460,359	20,000	104,726	1,336,700	1,022,962	varies	264,751	81,684

FH-5 & PHP-2 | Neighborhood Jamaica Plain | Fig. L-8

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
1	97,500							97,500							
2	51,415		(1)												51,415(A
3	10,189		(1)												10,189(B
4	14,700		(1)									14,700			
5	54,726									54,726					
7X	24,152														24,152(G
8	8501							8501							
9	99,000	x						20,000					oo	79,000	
10	2780														2780(C)
11	25,700	x			15		10,000								
12	40,500		(2)									40,500	oo		
13	Station						50,000								
14	Station						18,500								
15	60,000											60,000	oo		
16X	111,900	x	(3)			200	20,000		20,000				oo		
17	20,000											20,000			
18	40,000										40,000		oo		
19X	730,000							20,000			710,000	o			
20	29,800							29,800							

FH-5 & PHP-2	Neighborhood Jamaica Plain			Fig. L-8 Continued		DEVELOPMENT POTENTIAL									
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
21X	8500							8500							
22	25,000							25,000							
24	11,600										11,600				
25	18,624			2										9624	
26	155,000	x	(4)	60								55,000	oo		
27X	29,415			17											
29	30,814			18											
30	31,400		(5)	18											
31	3387													3387	
32	8386			3											
33	4098			1											
33a	6940														6940
34	19,760													19,760	
34a	3337														3337
35	32,000											32,000	oo		
36	32,900											32,900	oo		
38	8000													8000	
39	11,000											11,000			
40X	216,700										216,700				

FH-5 & PHP-2	Neighborhood Jamaica Plain			Fig. L-8 Continued					DEVELOPMENT POTENTIAL						
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
41X	247,400										247,400				
43X	3300														3300(D)
44	2000														2000(E)
45	42,000	x	(8)		18							o	oo		12,000(F
46	6000	x		2			2000						oo		
48	Station						2400								
49X	27,800	x					5000	17,800							
50	18,700	x					5000					8700	oo		
51	6100											6100	oo		
52	102,000											102,000	oo		
53	24,600											24,600	oo		
54	52,000											52,000	oo		
55	8400			3											
56	110,500											110,500	oo		
57	17,000	x		6			3000								
57X	7731	x		2			1000								
58	12,480											12,480	oo		
59	Station						2400								
60X	21,697	x	(11		10		5000								

FH-5 & PHP-2 | Neighborhood Jamaica Plain | Fig. L-8 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
61a	4550		(11)				4000								
61b	4413		(11)												4413(H)
62X	30,879		(12)		18								oo		
63	61,900	x	(13)		18							30,000	oo		
64	15,800											15,800			
64a	7450											7450			
65	14,202		(14)					14,202							3000(I)
65a	7983	x		3											
65X	7197			3											
66	130,400		(14)					130,400							
69	20,300							20,300				o	oo		
71	78,600	x					15,000	48,600				o	oo		
73X	11,867							11,867							
74	14,177	x			10		5000								
75X	249,562	x								50,000	100,000	49,562	oo		
Greenbelt	350,600											350,600			
Totals				138	89	200	148,300	452,470	20,000	104,726	1,325,700	1,035,892	Varies	119,771	123,526

FH-6 & PHP-1 | Neighborhood Jamaica Plain | Fig. L-9

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG. AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
1	97,500							97,500							
2	51,415		(1)												51,415(A
3	10,189		(1)												10,189(B
4	14,700		(1)									14,700			
5	54,726									54,726					
7X	24,152														24,152(G
8	8501							8501							
9	99,000	x						20,000					oo	79,000	
10	2780														2780(C)
11	25,700	x			15		10,000								
12	40,500		(2)									40,500	oo		
13	Station						50,000								
14	Station						18,500								
15	60,000											60,000	oo		
16X	111,900	x	(3)			200	20,000		20,000				oo		
17	20,000											20,000			
18	40,000										40,000		oo		
19X	740,000							20,000			720,000	o			

FH-6 & PHP-1 | Neighborhood Jamaica Plain | Fig. L-9 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
20X &21X	43,700							43,700							
22	25,000							25,000							
23	111,000													111,000	
24	11,600										11,600				
25	18,624			2										9624	
26	155,000	x	(4)	60								55,000	oo		
27X	29,415			17											
29	30,814			18											
30	15,821		(5)	8											
31	3387													3387	
32	8386			3											
33	4098			1											
33a	6940														6940
34	19,760													19,760	
34a	3337														3337
35	48,500											48,500	oo		
36	49,000											49,000			
38	40,500											40,500			
39	64,900											64,900			

FH-6 & PHP-1 | Neighborhood Jamaica Plain | Fig. L-9 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
40X	216,700										216,700				
41X	247,400										247,400				
43X	3300														3300(D)
44	2000														2000(E)
45	42,000	x	(8)		18							o	oo		12,000(F)
46	6000	x		2			2000						oo		
48	Station						2400								
49X	27,800	x					5000	17,800					oo		
52	97,000											97,000	oo		
53	74,100		(9)									74,100	oo		
54	146,900		(9)									146,900	oo		
55	8400			3											
56	91,500											91,500	oo		
57	24,600				10		5000					5000			
58	12,480											12,480			
59	Station						2400								
60X	21,697		(11)		10		5000								
61a	4550		(11)				4000								
61b	4413														4413(H)

FH-6 & PHP-1 | Neighborhood Jamaica Plain | Fig. L-9 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
62X	30,879		(12)		18								oo		
63	48,200											48,200	oo		
64	55,000											55,000			
64a	7450											7450	oo		
65	14,202		(14)					14,202							
65a	7983	X		3											3000(I)
65X	7197			3											
66	48,117		(14)					48,117							
67	74,100		(14)									74,100			
68	52,800		(14)									52,800			
69	58,800							58,800							
70X	38,130							38,130							
71	142,900	X					25,000	92,900							
73X	11,867							11,867							
74	14,177				10		5000								
75X	249,562	X								50,000	100,000	49,562	oo		
Greenbelt	38,500											38,500			
Totals				120	81	200	154,300	496,517	20,000	104,726	1,335,700	1,145,692	varies	222,771	123,526

ALT. # FH-1 | NEIGHBORHOOD ROXBURY | Fig. L-10

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
16	--														
17	56,000											56,000			
17X	191,000											o			
18	131,500	x	(1)			300	15,000		(1)		(1)	o	oo		
18a	15,000											15,000			
18b	122,000	x	(2)		(2)		60,000		(2)			o	oo		
19	26,000											26,000			
20	73,500	x	(3)		(3)		25,000					o	oo		
21	29,000											29,000			
22	172,500							172,500				o			
22a	33,000							33,000				o			
22b	70,000										70,000	o			
23	7,000											7,000			
24	107,500										107,500	o			
25	13,000														
25X	66,000														
25 + 25X	79,000		(4)		(4)					40,000			(4)		
25a	4,500														
26	98,000														

ALT. # FH-1	NEIGHBORHOOD ROXBURY			Fig. L-10 Continued				DEVELOPMENT POTENTIAL							
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
26X	102,000														
26 + 26X	200,000										200,000	o			
27	206,000	x	(5)					206,000		(5)	(5)	o			
28	109,000										109,000	o			
29	48,000											48,000			
30	40,500										40,500	o			
31	25,000									12,500					
32	73,000										73,000	o			
33	--														
34	31,500														
34X	223,500														
34 + 34X	255,000	x	(6)		200		75,000					o	oo		
35	32,500							32,500							
TOTALS					200	300	175,000	440,000		52,500	600,000	181,000			

ALT. # FH-2 | NEIGHBORHOOD ROXBURY | Fig. L-11

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
16	29,000														
16X	54,000														
16 + 16X	83,000											83,000	oo		
17	56,000											56,000			
17X	191,000											o			
18	255,000	x	(7)		(7)	300	75,000		150,000		(7)	o	oo		
18a	15,000											15,000			
19	26,000											26,000			
20	92,000	x	(3)		(3)		25,000					o	oo		
21	18,500											18,500			
22	297,000										297,000	o			
23	8,000											8,000			
24	66,000										66,000	o			
25	13,000														
25X	66,000														
25 + 25X	79,000		(4)		(4)					40,000		o	(4)		
25a	4,500											o			
26	167,000														
26X	102,000														

ALT. # FH-2 | NEIGHBORHOOD ROXBURY | Fig. L-11 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
26 + 26X	269,000										269,000	o			
27	27,000											27,000			
28	120,500										120,500	o			
29	15,000											15,000			
30	40,500										40,500	o			
31	25,000									12,500					
32	58,000										58,000	o			
33	--														
34	125,000														
34X	223,500														
34 + 34X	348,500	x	(6)		200		75,000					o	oo		
35	--														
TOTALS					200	300	175,000		150,000	52,500	851,000	248,500			

ALT. # FH-2b	NEIGHBORHOOD ROXBURY			Fig. L-12			DEVELOPMENT POTENTIAL								
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
	NOTE:	ALTERNATIVE FH-2b IS INDENTICAL TO ALTERNATIVE FH-2 THROUGH PARCEL 32													
33	--														
34	54,500														
34X	223,500														
34 + 34X	278,000	x	(6)		200		75,000					o	oo		
35	62,000						25,000					o	oo		
TOTALS					200	300	200,000		150,000	52,500	851,000	248,500			

ALT. # FH-2c	NEIGHBORHOOD ROXBURY			Fig. L-13				DEVELOPMENT POTENTIAL							
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
	NOTE: ALTERNATIVE FH-2c IS IDENTICAL TO ALTERNATIVE FH-2 THROUGH PARCEL 32														
33	21,500											21,500			
34	117,500														
34X	223,500														
34 + 34X	341,000	x	(6)		200		75,000					o	oo		
35	23,000											23,000			
TOTALS					200	300	175,000		150,000	52,500	851,000	293,000			

ALT. # FH-3

NEIGHBORHOOD ROXBURY

Fig. L-14

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
16	--														
17	56,000											56,000			
17X	191,000											o			
18	131,500	x	(1)			300	15,000		(1)		(1)	o	oo		
18a	15,000											15,000			
18b	122,000	x	(2)		(2)		60,000		(2)			o	oo		
19	26,000											26,000			
20	73,500						25,000					o	oo		
21	29,000											29,000			
22	172,500							172,500				o			
22a	33,000							33,000							
22b	70,000										70,000	o			
23	7,000											7,000			
24	107,500										107,500	o			
25	13,000														
25X	66,000														
25 + 25X	79,000									40,000					
25a	4,500														
26	98,000														

ALT. # FH-3 | NEIGHBORHOOD ROXBURY | Fig. L-14 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
26X	102,000														
26 + 26X	200,000										200,000	o			
27	206,000	x	(5)					206,000		(5)	(5)	o			
28	109,000										109,000	o			
29	48,000											48,000			
30	40,500										40,500	o			
31	25,000									12,500					
32	73,000										73,000	o			
33	26,000											26,000			
34	31,500														
34X	223,500														
34 + 34X	255,000	x	(6)		200		75,000					o	oo		
35	32,500							32,500							
TOTALS					200	300	175,000	444,000		52,500	600,000	207,000			

ALT. # FH- 4

NEIGHBORHOOD ROXBURY

Fig. L-15

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
16	29,000														
16X	54,000														
16 + 16X	83,000											83,000	oo		
17	56,000											56,000			
17X	191,000											o			
18	255,000	x	(7)			300	75,000		150,000		(7)	o	oo		
18a	15,000											15,000			
19	26,000											26,000			
20	92,000						25,000					o			
21	18,500											18,500			
22	297,000										297,000	o			
23	8,000											8,000			
24	66,000										66,000	o			
25	13,000														
25X	66,000														
25 + 25X	79,000									40,000					
25a	4,500														
26	167,000														
26X	102,000														

ALT. # FH-4 | NEIGHBORHOOD ROXBURY | Fig. L-15 Continued

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
26 + 26X	269,000										269,000	o			
27	27,000											27,000			
28	120,500										120,500	o			
29	15,000											15,000			
30	40,500										40,500	o			
31	25,000									12,500					
32	58,000										58,000	o			
33	17,500											17,500			
34	125,000														
34X	223,500														
34 + 34X	348,500	x	(6)		200		75,000					o	oo		
35	--														
TOTALS					200	300	175,000		150,000	52,500	851,000	266,000			

ALT. # FH-4a | NEIGHBORHOOD ROXBURY

Fig. L-16

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
	NOTE:	ALTERNATIVE FH-4a IS INDENTICAL TO ALTERNATIVE FH-4 THROUGH PARCEL 32													
33	--														
34	54,500														
34X	223,500														
34 + 34X	288,000	x	(6)		200		75,000					o	oo		
35	--														
TOTALS					200	300	175,000		150,000	52,500	851,000	266,000			

ALT. # FH- 4b	NEIGHBORHOOD ROXBURY			Fig. L-17			DEVELOPMENT POTENTIAL								
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG. AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
	NOTE: ALTERNATIVE FH-4b IS IDENTICAL TO ALTERNATIVE FH-4 THROUGH PARCEL 32														
33	21,500											21,500			
34	117,500														
34X	223,500														
34 + 34X	341,000	x	(6)		200		75,000					o	oo		
35	23,000											23,000			
TOTALS					200	300	175,000		150,000	52,500	851,000	310,000			

ALT. # FH-5 & PHP-2

NEIGHBORHOOD ROXBURY

Fig. L-18

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
16	29,000														
16x	54,000														
16+16x	83,000											83,000	00		
17	56,000											56,000			
17x	191,000											0			
18	255,000	x	(7)		(7)	300	75,000		150,000		(7)	0	00		
18a	15,000											15,000			
19	33,000											33,000			
20	105,000	x	(3)				25,000					0	00		
21	12,000									(8)					
22	267,000										267,000	0			
23	3,000											3.000			
24	54,500										54,500	0			
25	83,500		(4)							40,000		0	(4)		
25a	10.000									5,000					
26	141,000														
26x	102,000														
26+26x	243,000										243,000	0			
27	8,000											8,000			

ALT. # FH-5 & PHP-2 | NEIGHBORHOOD ROXBURY | Fig. L-18 (Continued) DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG. AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
27a	59,000						10,000			(8)					
27b	29,000									14,000					
28	114,000										114,000	0			
29	6,000											6,000			
30	36,000										36,000	0			
31	40,000									20,000					
32	38,000										38,000	0			
32a	7,000											0		7,000	
33	--														
34	119,000														
34x	219,000														
34+34x	338,000	x	(6)		200		75,000					0	00		
35	--														
TOTALS					200	300	185,000		150,000	79,000	752,500	204,000		7,000	

ALT. # FH-6 & FHP-1 | NEIGHBORHOOD ROXBURY | Fig. L-19

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
	NOTE: ALTERNATIVE FH-6 IS IDENTICAL TO ALTERNATIVE FH-5 THROUGH PARCEL 32A														
33	--														
34	46,000														
34x	219,000														
34+34x	265,000	x	(6)		200		75,000					0	00		
35	73,000						25,000					0	00		
TOTALS					200	300	210,000		150,000	79,000	752,500	204,000		7,000	

ALT. # FH-6a	NEIGHBORHOOD ROXBURY			Fig. L-20			DEVELOPMENT POTENTIAL								
PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)

NOTE: ALTERNATIVE FH-6A CONTAINS PARCELS THAT ARE IDENTICAL TO ALTERNATIVE FH-5 (FIG. VII-39)

THE ARTERIAL STREET IN ALTERNATIVE FH-6A TERMINATES AT JACKSON SQUARE PERPENDICULAR TO CENTRE STREET.

ALT. # SC-1 & PHP 1&2

NEIGHBORHOOD SOUTH END

Fig. L-21

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
1	3,000	x	(1)				10,000		10,000			0	00		
2	7,600	x	(1)				20,000		20,000			0	00		
3	3,500	x			9		3,500					0			
4	2,100											2,100		X	
5	2,000											2,000		X	
6	4,000	x			12		4,000					0			
7	900											0		X	
Back Bay Station		x					25,000		150,000			0	00		
TOTALS					21		62,500		180,000			4,100			

ALT. # SC-2 | NEIGHBORHOOD SOUTH END | Fig. L-22

DEVELOPMENT POTENTIAL

PARCEL	AREA (SQ.FT.)	MIXED USE	ALTERNATE	HOUSING 1-4 FAMILY (D.U.)	HOUSING MULTI FAMILY (D.U.)	HOTEL/MOTEL (ROOMS)	RETAIL AND SERVICE RETAIL (SF BLDG AREA)	AUTO-ORIENTED COMMERCIAL (SF LAND AREA)	OFFICE (SF BLDG. AREA)	MANUFACTURING (SF BLDG.AREA)	INSTITUTIONAL (SF LAND AREA)	OPEN SPACE (SF LAND AREA)	COMMUNITY FACILITY (VARIOUS UNITS)	SELL TO ABUTTORS (SF LAND AREA)	RESELL AS IS (VARIOUS UNITS)
1	3,000	x	(1)				10,000		10,000			0	00		
2	7,600	x	(1)				20,000		20,000			0	00		
3	3,500	x			9		3,500					0			
Back Bay	Station						25,000		150,000			0	00		
TOTALS					9		58,500		180,000						